

Kennedy/Jenks/Chilton

REPORT OF TECHNICAL DOCUMENTS REVIEW
AND GROUNDWATER SAMPLING

MCDONNELL DOUGLAS CORPORATION
DOUGLAS AIRCRAFT COMPANY, C6 FACILITY
TORRANCE, CALIFORNIA

K/J/C 904020.00

12 June 1991

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Subject: Report of Technical Documents Review
and Groundwater Sampling
McDonnell Douglas Corporation
Douglas Aircraft Company, C6 Facility
Torrance, California
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Kennedy/Jenks/Chilton is pleased to submit this report pursuant to the Scope of Services contained in Task Order Nos. 1 and 2 of the 24 September 1990 contract (GMA-3408-C) between McDonnell Douglas Corporation (MDC) and Kennedy/Jenks/Chilton for consulting services in connection with Douglas Aircraft Company (DAC) C6 Facility in Torrance, California.

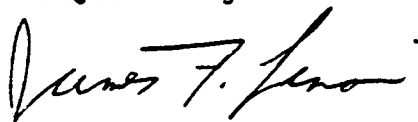
Please contact us if you have any questions or need additional information.

Very truly yours,

KENNEDY/JENKS/CHILTON



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Project Manager



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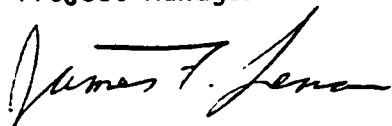
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EXECUTIVE SUMMARY

This report summarizes the findings of an analysis of environmental conditions that could have resulted in the presence of chloroform concentrations reported in samples of shallow groundwater beneath the Douglas Aircraft Company (DAC) C6 facility located at 19503 South Normandie Avenue in Torrance, California. The findings of the technical document review and groundwater sample analyses indicate that chloroform occurrence in the Upper Bellflower Aquitard at the location of monitoring well MW-9 is associated with chemical releases at the Montrose Chemical Corporation Superfund site.

The DAC C6 Facility is located immediately to the north of the Montrose Site, which is the subject of a Remedial Investigation (RI) being conducted at the direction of the United States Environmental Protection Agency (EPA) under Administrative Order on Consent, EPA Docket Number 85-04. The Montrose Site is owned by Montrose Chemical Corporation of California and is the former site of a dichlorodiphenyltrichloroethane (DDT) manufacturing plant that was operated by Montrose between approximately 1947 and 1982. As part of the RI, several shallow groundwater monitoring wells were constructed on DAC C6 property. Reproducible analytical results for groundwater samples collected from these wells indicate the presence of appreciable concentrations of chloroform and chlorobenzene in shallow groundwater in one area beneath the DAC C6 property. While the source of both chlorobenzene and chloroform appears to be the former Montrose manufacturing plant, the possibility that the chloroform detected in groundwater is not related to the DDT manufacturing operation and that it may have originated from a different source, has been postulated by Hargis & Associates, Inc. (letter to U.S. Environmental Protection Agency, dated February 6, 1990).

The scope of the analysis included a review of available public documents, aerial photographs, and information on local and regional environmental conditions; examination of chemical fate and mobility considerations; and evaluation of hydrogeologic conditions. This report also contains results of groundwater sampling and analysis, which was conducted to evaluate whether the occurrence of chloroform in shallow groundwater in the vicinity of the DAC C6 and Montrose properties is correlated to possible "indicator compounds" of chemical release at the Montrose Site.

Possible sources for introduction of significant masses of chlorobenzene and chloroform into the subsurface environment on the Montrose Site appear to be: (1) the former railroad tank car off-loading areas in the northeastern and southeastern portions of the Montrose property, and (2) the wastewater settling pond formerly located in the north-central portion of the Montrose property. The first potential source area consisted of rail spurs where tank cars containing the raw materials for DDT production were spotted and their contents transferred to fixed storage facilities. The off-loading operations involved connecting appropriately sized hoses/piping to the tank car and

pumping the contents, via fixed pumping stations, to above-ground tanks. Such operations often result in some spillage of the liquids being transferred, particularly during the disconnecting of hoses and manipulation of tank car valves. The principal raw material for DDT production, which was received in bulk rail deliveries along this spur for many years was a mixture of chlorobenzene and chloral. Because chloral is unstable in the presence of oxygen, it was delivered pre-mixed with chlorobenzene (approximately one part chloral to 1.5 to 1.8 parts chlorobenzene). This mixture was subsequently enriched during the DDT production process to the 2:1 ratio of chlorobenzene to chloral required for DDT synthesis. The chlorobenzene/chloral mixture delivered to the Montrose Site was produced at a Montrose Chemical Corporation facility located in Henderson, Nevada, which reported that the chloral produced for the mixture also contained about 0.1 to 0.2 percent chloroform by weight. Historical aerial photographs confirm that the area of the tank car bulk transfer operations was unpaved for many years. This area is, therefore, regarded as a location where it is probable that significant masses of both chlorobenzene and chloroform could have been co-released to the subsurface environment.

The second potential source area, the wastewater settling pond, is significant both as a location of possible discharge of chemicals to the subsurface environment and as an important potential influence of chemical transport in that environment. During its years of operation as a DDT production facility, Montrose maintained a runoff and wastewater "settling" pond on the north-central portion of its property. The pond, which measured approximately 75 feet by 50 feet by 15 feet deep, received wastewater from plant operations and runoff from the central processing area. In its early years of operation (i.e., prior to 1970), the pond was unlined and functioned as a settling basin along the main wastewater discharge line from the plant. In 1970, the pond was lined with concrete and incorporated into a water recycling system that was designed to reduce the amount of wastewater discharged from the facility. Because the flow of runoff water into the pond was largely unregulated and because monitoring of water accumulated in the pond appears to have been limited to general water quality indicator parameters such as pH and total dissolved solids, the types, concentrations, and cumulative quantities of organic chemicals discharged to the settling pond cannot be documented. However, the operational history of the pond, as reconstructed from review of aerial photographs and documents contained in California Department of Health Services' files clearly suggest that virtually any of the DDT process chemicals could have entered the waters received by the pond. Because low pH water potentially entering nearby sewer lines was of concern to regulatory agencies, the pH of the water discharged from the Montrose facility through the pond was reportedly checked and neutralized or raised above 7.0 to address the regulatory concerns regarding acidic waters and corrosion.

Reviewing the information contained in the discussion above and considering known chemical reactions, the following possible sources of chloroform related to DDT production on the Montrose Site have been identified: (1) chloroform contained as an impurity in the chlorobenzene/chloral mixture that was used as the principal raw product for the synthesis of DDT, and (2) chloroform formed

by hydrolysis of chloral. Chloral hydrolysis occurs more rapidly under alkaline (i.e., pH greater than 7.0) conditions. Chloroform contained in the chlorobenzene/chloral mixture could have been released into the subsurface environment at the railroad tank car off-loading area, in solution with wastewater at the settling pond, or at any of a number of other areas on the Montrose Site where chlorobenzene/chloral mixture was stored or processed. Transformation of chloral to chloroform could have occurred in the DDT manufacturing process when the molten DDT was "washed" with caustic (sodium hydroxide) solution, in the settling pond during wastewater neutralization, or in the subsurface environment itself. Montrose Chemical Corporation has contended that the neutralization process used in DDT production did not constitute a strong base reaction and, therefore, chloroform would not be expected to form as a result of chloral decomposition. Even if this reasoning is accepted it does not preclude the possibility that the chloroform detected in the groundwater beneath the site originated as a result of chloral discharge on the DDT manufacturing site. Also, although the rate at which chloral is transformed to chloroform is most rapid under high pH (i.e., basic) conditions, this transformation can occur at slower rates under moderately basic or nearly neutral subsurface environmental conditions. Considering the elapsed time from the last DDT production activities to the present, even extremely slow-rate transformation mechanisms may account for the occurrence of chloroform beneath the site.

Review of groundwater monitoring data presented in the Montrose Site RI report indicates that the highest reported concentrations of chloroform in groundwater (e.g. 74,000 ug/L in April 1990) have been detected in samples collected from monitoring well MW-09 which is completed in the Upper Bellflower Aquitard (i.e., uppermost saturated zone) in a south parking area on DAC C6 Facility. Groundwater samples collected from this well have also contained appreciably higher concentrations of chlorobenzene (e.g., 180,000 ug/L in April 1990). Other wells where appreciable concentrations of chlorobenzene and chloroform have been consistently detected in groundwater samples include MW-1, MW-2, MW-5, MW-6, MW-11, MW-12, and MW-13. The reported chlorobenzene concentrations consistently exceed those reported for chloroform, which is consistent with the expected concentration relationship that would be expected to result from the discharge of the chlorobenzene/chloral mixture to the subsurface.

Monitoring well MW-09 lies hydraulically upgradient of the potential chlorobenzene/chloral mixture surface discharge locations described above, when "upgradient" is evaluated in terms of the apparent present-day piezometric and groundwater movement regimes in the Upper Bellflower Aquitard. This raises questions regarding the subsurface chemical transport mechanisms that might account for the presence of chlorobenzene and chloroform in the groundwater of the uppermost saturated zone some 230 feet north (upgradient) of the Montrose property boundary. Such chemical transport is significantly influenced by all of the following: (1) the concentration, quantity, and duration of the chemical release; (2) the geologic and chemical characteristics of the unsaturated zone, including sediment types, permeabilities, moisture contents, stratigraphic structure, and organic

content; (3) hydrogeologic and chemical characteristics of strata comprising the uppermost saturated zone; (4) history of surface water percolation (recharge) through to the unsaturated zone in the chemical release vicinity, particularly transient events that occurred in the past; and (5) history of piezometric fluctuations and perturbations of the uppermost saturated zone. Consideration of the site-specific factors governing subsurface chemical transport in the vicinity of the DAC C6 Facility and the Montrose Site provides a reasonable and logical transport model that accounts for the presence of chlorobenzene and chloroform in groundwater that technically occurs hydraulically upgradient, in a lateral sense, from the probable surface release locations for these chemicals. In such a model, chlorobenzene and chloroform discharge to surficial soils on the Montrose Site at either the tank car off-loading area or the settling pond migrated northerly through either (1) spreading and structurally governed flow in the unsaturated zone, (2) migration in the uppermost saturated zone due to diffusion and/or localized, ephemeral perturbations in the piezometric surface resulting in north-flowing groundwater conditions, or (3) a combination of these phenomena. Physical site characteristics, historic practices/operations, and investigation information that support this model include:

1. Examination of lithologic logs of soil borings and monitoring wells from the Montrose RI show that the unsaturated zone beneath the Montrose and DAC C6 properties varies from about 60 to 70 feet thick and is comprised of interbedded sands, silts, and clays. The uppermost portion of the unsaturated zone (i.e., typically ground level to about 25 to 30 feet below ground surface or bgs) is predominantly silts and clays (fine-grained sediments). The lower portion of the unsaturated zone (i.e., the Palos Verdes Sand) is typically comprised of fine sand or silty sand. Based upon typically observed soil/water interactions and generally-accepted hydrogeologic principles, one would expect water (or aqueous solutions of organic chemicals) infiltrating at ground surface under constant head (i.e., settling pond conditions) and percolating through fine-grained unsaturated zone sediments, such as those present beneath the Montrose Site, to exhibit appreciable lateral (horizontal) movement or spreading away from the point of introduction to the subsurface. Accordingly, the steady-state saturated recharge "mound" (i.e., piezometric mound) that almost certainly penetrated the surrounding unsaturated sediments beneath the settling pond on the Montrose Site at times during the plant's historic operations, would have probably pushed waters discharging to the subsurface from the pond considerable lateral distances radially (in all directions) from the pond. Water migrating downward in the subsurface from the pond and spreading laterally as they did so, could have intercepted unsaturated zone areas already impacted by the surface discharge of chemicals of concern (e.g., the tank car off-loading area) and enhanced downward and lateral migration of the chemicals. Further, if chloral were present in soils beneath the tank car off-loading area, basic (alkaline) water recharging from the settling pond might have enhanced its transformation into chloroform.

2. Review of stratigraphic information presented in the RI boring logs indicates that there is at least one distinct unsaturated zone stratum that was encountered and recorded in the investigative borings. This stratum is a well-cemented fossiliferous sand consistently encountered between 30 and 40 feet bgs, that appears to be laterally continuous beneath the DAC C6 and Montrose properties. The Montrose Site's unsaturated zone is mainly comprised of marine sediments (i.e., deposited in a flat-lying configuration) that were probably deformed or uplifted at some time following deposition. This fossiliferous sand unit is an important key to the structure of the unsaturated zone sediments beneath the Montrose and DAC C6 properties, because most of the other sediments comprising the zone appear massive and undifferentiable when logging drill cuttings. Plotting the depth to occurrence of the fossiliferous sand indicates that this unit dips to the north on an angle of about one and one-half degrees from horizontal beneath Montrose. Because of the well-cemented nature of the fossiliferous zone and the implication that other unsaturated (and uppermost saturated) strata beneath the site also dip to the north, structurally-influenced preferential migration to the north of fluids percolating downward in the unsaturated zone to the water table is a viable hypothesis. The configuration of the occurrence of dense non-aqueous phase liquid (DNAPL) reported by Hargis + Associates in the RI appears to support the hypothesis of structurally-influenced preferential migration. The RI states: "Based on available data, DNAPL apparently occurs over an area extending several hundred feet east and north from the central process area" (page ES-7 in the RI Report). This is consistent with the hypothesis, assuming that the DNAPL was introduced into the subsurface in the central processing area.
3. The prolonged presence of the recharge mound discussed in item 1 above, during the years that the settling pond was unlined, would have resulted in localized areas of pronounced northerly flow conditions in the shallow groundwater beneath the site. Because of the low hydraulic conductivity of the sediments comprising the Bellflower Aquitard and the relatively flat hydraulic gradient in the aquitard under unperturbed conditions, chemicals introduced into the shallow groundwater of the Bellflower Aquitard in significant concentrations at a given location might remain for many years following dissipation of the recharge mound. This is because groundwater movement is normally extremely slow, sorption of organic chemicals to the fine-grained sediments probably occurs to an appreciable extent, and "flushing" of the uppermost saturated portion of the aquitard would not occur at a significant rate. In addition, chemical concentration gradients existing beneath the Montrose and DAC C6 properties probably favor diffusive migration away from the Montrose property (i.e., towards DAC) and do not promote natural flushing processes.

As a means of testing the chemical/transport model and supporting theories described in the foregoing, Kennedy/Jenks/Chilton recommend that selected groundwater monitoring wells on and around the Montrose Site (including MW-09)

be sampled and the groundwater samples analyzed for para-chlorobenzenesulfonic acid (p-CBSA), a chemical known to be a unique synthesis by-product of DDT manufacturing. p-CBSA is considered to be a certain indicator chemical for contaminant mixtures suspected to have originated from DDT production and, therefore, its detection in a well that is located hydraulically upgradient of the Montrose Site would strongly support the conclusion that other chemicals (i.e., chlorobenzene and chloroform) detected in the well originated from DDT production activities. During January 30 through February 1, 1991, Kennedy/Jenks/Chilton sampled 15 monitoring wells at/near the Montrose Site.

Two significant conclusions were drawn from the results of the groundwater sampling and analysis investigation described above:

1. p-CBSA was detected in the groundwater sample collected from monitoring well MW-09. p-CBSA is a synthesis by-product of DDT manufacture and is unique to DDT production. Occurrence of this chemical in the sample from monitoring well MW-09 is a clear indication that wastes associated with DDT manufacture (i.e., the Montrose Site) migrated to the location of monitoring well MW-09.
2. Chloroform was detected in a sample of DNAPL collected from monitoring well MW-2, which is located on the Montrose property, at the approximate location of the former wastewater settling pond. The occurrence of chloroform in this material is further evidence that the Montrose Site is a source of chloroform to shallow groundwater.

These findings, along with the results of the technical document review, substantiate that the occurrence of chloroform and chlorobenzene in shallow groundwater beneath the DAC C6 property, particularly at/near the location of monitoring well MW-09, appears to be associated with chemical releases on the Montrose Site.

1.0 INTRODUCTION

This report presents the findings of an analysis of environmental conditions on and in the vicinity of the Douglas Aircraft Company (DAC) C6 Facility located at 19503 South Normandie Avenue in Torrance, California. The objective of the analysis was to evaluate industrial operations and known environmental conditions at or near the DAC C6 property that could have resulted in the presence of chloroform concentrations reported in samples of shallow groundwater beneath the DAC C6 property.

The DAC C6 Facility is located immediately to the north of the Montrose Site (see Figure 1-1), which is the subject of a Remedial Investigation (RI) being conducted at the direction of the United States Environmental Protection Agency (EPA) under Administrative Order on Consent, EPA Docket Number 85-04. The Montrose Site is owned by Montrose Chemical Corporation of California and is the former site of a dichlorodiphenyltrichloroethane (DDT) manufacturing plant that was operated by Montrose between approximately 1947 and 1982. As part of the RI, several shallow groundwater monitoring wells were constructed on DAC C6 property. Reproducible analytical results for groundwater samples collected from these wells indicate the presence of appreciable concentrations of chloroform and chlorobenzene in shallow groundwater in one area beneath the DAC C6 property. The occurrence of the chloroform detected in groundwater beneath the DAC C6 property appears to be closely related to that of chlorobenzene. While the source of both chlorobenzene and chloroform appears to be the former Montrose manufacturing plant, the possibility that the chloroform detected in groundwater is not related to the DDT manufacturing operation and that it may have originated from a different source, has been postulated by others.

The scope of the analysis included a review of available public documents, aerial photographs, and information on local and regional environmental conditions; examination of chemical fate and mobility considerations; and evaluation of hydrogeologic conditions. This report also contains results of groundwater sampling and analysis, which was conducted to evaluate whether the occurrence of chloroform in shallow groundwater in the vicinity of the DAC C6 and Montrose properties is correlated to possible "indicator compounds" of chemical release at the Montrose Site.

2.0 PUBLIC RECORD RESEARCH AND AERIAL PHOTOGRAPHY REVIEW

This section presents the review findings of a record search of nearby sites, discussion of an historic aerial photograph study, and an overview of the Montrose Chemical Corporation Site.

2.1 Approach

The primary objective of the record research was to evaluate sites in close proximity to the DAC C6 property that may have had chemical releases that might account for the reported concentrations of chloroform and chlorobenzene in shallow groundwater beneath the DAC C6 property. The initial task of the record search consisted of reviewing the following published lists to acquire names and addresses of reported and potential hazardous waste sites within an approximate one-mile radius of the DAC C6 property:

- **Computer Case Listing of Reported Underground Tank Leaks and Pertinent Codes**, California Regional Water Quality Control Board, Los Angeles Region, September 1988.
- **Solid Waste Assessment Test (SWAT) List**, California Water Resources Control Board, November 1988.
- **Hazardous Waste Cleanup Bond Act Expenditure Plan Database (State Superfund)**, California Department of Health Services, Toxic Substances Control Division, May 1990.
- **Proposition 65 Discharge Data - Los Angeles County**, California Department of Health Services, Toxic Substances Control Division, January 2, 1987.
- **Abandoned Site Program Information System List (ASPIS)**, California Department of Health Services, Toxic Substances Control Division, May 1990.
- **Cortese List of Identified Hazardous Waste and Substances Sites**, California Department of Health Services, Toxic Substances Control Division, May 1990.
- **Federal Superfund Sites (CERCLIS)**, United States Environmental Protection Agency, Region 9, May 1990.
- **Federal National Priority List (NPL) Sites**, United States Environmental Protection Agency, Region 9, May 1990.
- **RCRA Database - Hazardous Waste Generators**, United States Environmental Protection Agency, Region 9, April 1989.

Available, public information and records regarding sites identified during review of the above-itemized lists were reviewed at the following governmental offices to gain detailed information:

- California Regional Water Quality Control Board, Los Angeles Region
- California Department of Health Services, Toxic Substances Control Division.
- South Coast Air Quality Management District
- Los Angeles County Department of Health
- County Sanitation Districts of Los Angeles County, Industrial Waste Control Division
- Los Angeles County Department of Public Works, Waste Management Division
- Los Angeles County Department of Public Works, Hydraulic Conservation Division
- Los Angeles County Fire Department
- Los Angeles City Fire Department, Harbor Division
- Los Angeles City Department of Sanitation, Industrial Waste Division
- Los Angeles City Department of Building and Safety

Information obtained at these offices included reports containing site investigation and cleanup descriptions; hydrogeologic characterizations; and chemical and waste handling, storage, generation, and disposal practices.

Available historic aerial photographs were also studied to evaluate previous land uses and to attempt to identify historic land use activities that would suggest areas of potential environmental concern. Aerial photographs viewed are listed below.

- Whittier College, California (Fairchild Aerial Photography Collection). Photograph dates: 1927, 1928, 1941, 1946, 1947, 1948, 1951, 1952, 1953, 1954, 1956, and 1957. Enlargements of four photographs (1941, 1947, 1951, and 1956) were obtained.
- Brewster Pacific Corporation, Pasadena, California. Photograph dates: 1970 and 1975.
- Kennedy/Jenks/Chilton Library. Photograph dates: 1947, 1956, 1960, 1965, 1968, 1973, and 1979.
- Private source. Photograph date: 1982 (oblique).

The majority of available photographs at Whittier College (Fairchild Collection) were of small scale (i.e., one inch to 2,000 feet, and smaller). General land features and buildings and other large structures could be identified in these photographs, but details were difficult to discern. In order to study pertinent features in more detail, the enlargements specified above were obtained.

2.2 Historic Aerial Photographs

Earliest available photographs, 1927 and 1929, show the areas now occupied by the Montrose Site and the DAC C6 facility cultivated for fruit and/or vegetable production. These early photos also show evidence of petroleum exploration and processing in this area, i.e., oil wells and tank farms were observed. The next most recent flight coverage was 1941. Industrial development was discernable on the 1941 flight coverage of the Montrose Site. The building configuration on the Montrose Site appeared different from the configuration during later years when Montrose Chemical Corporation occupied the site. Hughes-Mitchell operated the Montrose Site from around 1934-35 to 1944, when it sold the property to Stauffer Chemical (i.e., parent company of Montrose Chemical). The Hughes-Mitchell operation involved processing mineral ore into paint. Sulfuric and hydrochloric acids were used in the paint processing operation. Numerous above-ground tanks were present on the Montrose Site in the 1941 photographs. East-west running railroad tracks were located near the southern property line of the Montrose Site. Three north-south spurs branched off these tracks and transected the Montrose property.

Development on the DAC C6 property in 1941 was limited to localized agricultural activity. The west-central portion of the DAC C6 property was cultivated, and several structures were located at the southeast corner of the property.

There was no flight coverage available during World War II (1942-46). In 1947 photos, the DAC C6 property was developed for industrial use. An east-west running railroad spur located near the property line of the DAC C6 and Montrose properties was observed in the 1947 photograph. The southern portion of the DAC C6 property, adjacent to the Montrose Site, was used for storage of unidentified objects; the material or equipment stored in this area could not be ascertained. Fewer structures were located on the Montrose Site than in 1941 photographs.

Montrose Chemical appeared to be at an operational level in 1951 photographs that was similar to its peak production level in later years. A wastewater settling pond located center of the property appeared present at this time. Development on the DAC C6 property appeared relatively unchanged from conditions in 1947. The storage area at the southern portion of the DAC C6 property was unpaved and clear of any equipment.

In 1956 flight coverage, most of the south portion of the DAC C6 property (except the extreme southeast corner) was paved and used for parking. Conditions on the Montrose Site appeared similar to conditions observed in 1951 photographs. A feature that appears to be an electrical sub-station was located to the southwest of the Montrose Site in 1956.

The wastewater settling pond located at the Montrose property appeared unlined in 1960, 1965, and 1968 photographs. During these years, the pond appeared irregularly shaped, similar to a natural pond. The pond also appeared to contain standing water during this time. A large building was present in the center of the Montrose property; this building was constructed between 1960 and 1965.

An approximately 75 foot by 100 foot area of apparent standing water was observed at the west-central portion of the Montrose Site in a February 1970 photograph. This area and other unpaved areas, such as areas surrounding railroad tracks, are potential locations for surface recharge. The potential for surface recharge is discussed further in Section 4.0. The wastewater settling pond located on the Montrose Site appeared lined in 1970 (i.e., it appeared to be uniformly shaped). Jones Chemical, located to the southwest of the Montrose Site, appeared in operation in 1970.

Conditions on the DAC C6 property in 1960 through 1970 appeared similar to conditions in 1956, and physical development on the Montrose Site and DAC C6 property remained relatively unchanged between 1970 and 1975. By 1975, a second electrical substation was constructed to the south of the Montrose Site.

Physical conditions on the DAC C6 and Montrose properties in 1982 remained relatively unchanged from those shown in the 1975 and 1970 photographs. One discernable change was that the southeast corner of the DAC C6 property (northwest of the railroad spur) was being used for equipment storage in 1982.

2.3 Surrounding Properties

There are several reported and potential hazardous waste sites in the heavily industrialized area encompassing the DAC C6 and Montrose properties (see Figure 2-1). These sites are briefly described in Table 2-1. The objective of reviewing records on these sites was to identify possible chemical releases that could account for the occurrence of chloroform and chlorobenzene in the vicinity of DAC C6 property. In addition, interpretations of hydrogeologic conditions at/near these sites were reviewed to provide information on subsurface chemical transport.

Two of the sites listed in Table 2-1 are federal Superfund sites (i.e., the Montrose Site and the Del Amo Boulevard Site), and a few of the sites have appreciable reported soil and groundwater contamination. However, with the exception of the Montrose Site, it is unlikely that chemical releases at these sites could have accounted for chloroform and chlorobenzene concentrations in shallow groundwater underlying the DAC C6 Facility.

2.4 The Montrose Chemical Corporation Site

The Montrose Chemical Corporation Site (Montrose Site), located at 20201 South Normandie Avenue in Torrance, California, has been owned by Stauffer Chemical Company (a 50 percent owner of Montrose Chemical Corporation) since 1946. Based on available records, the property was first developed for industrial use around 1934 or 1935, when Hughes-Mitchell bought the property and constructed a paint processing facility. Prior to that time, the property was

apparently developed for agricultural use. The Hughes-Mitchell operation involved processing ore into paint using sulfuric and hydrochloric acids. Sears Roebuck Company bought the property at some time between 1937 and 1944. Sears sold the property to Stauffer Chemical Company in about 1944. As part of the war effort, Stauffer agreed to operate the existing sulfuric acid plant. Montrose has leased the property from Stauffer since 1946 and began operations on May 8, 1947. Montrose Chemical produced dichlorodiphenyltrichloroethane (DDT) at the facility from 1947 until late 1982. Operations included manufacturing, formulation, grinding, packaging, and distribution of the pesticide.

Copies of available Montrose Site records at the California Department of Health Services (California-DHS) were obtained and reviewed. California-DHS files were researched because this office maintains the most extensive, locally-accessible records on the Montrose Site. The EPA is the lead agency for the Montrose Site, but the California-DHS is the local project contact.

The majority of records on the Montrose Site at the California-DHS consists of site investigation reports published by Hargis + Associates, Inc., who are conducting the remedial investigation (RI) of the site for Montrose Chemical Corporation of California. The California-DHS files also contain a considerable volume of correspondence and background information.

In November, 1982, United States Environmental Protection Agency (EPA) investigated the site and confirmed DDT contamination in soils onsite and in drainage pathways from the property. Samples of stormwater discharged from the site also contained DDT. As a result of these findings, EPA issued a Comprehensive Environmental Response Compensation and Liability Act (CERCLA) Section 106 Order to Montrose in May, 1983, to eliminate the discharge of DDT from site and to investigate the previously documented onsite soil contamination. Montrose constructed a temporary berm in 1983 to contain storm water and prevent off-property surface water drainage. Shallow soil borings were drilled onsite and at locations immediately south of the property.

The site was proposed for inclusion on the Superfund National Priorities List (NPL) in October 1984. The Remedial Investigation (RI) of the Montrose Site was conducted by Hargis + Associates, Inc. during the period 1985 to April 1990. The RI consisted of soil, groundwater, surface water, and sediment sampling at onsite and offsite locations. The EPA designated the following target chemicals for the Montrose Site RI: DDT and its metabolites DDE and DDD; benzene hexachloride (BHC); chlorobenzene; dichlorobenzene; benzene; chloroform; and acetone.

As part of the Montrose Site RI, four monitoring wells were drilled on the DAC C6 property. These wells were completed in the uppermost groundwater zone, i.e., the Upper Bellflower Aquitard. Two of the Montrose Site target chemicals (i.e., chlorobenzene and chloroform) have been consistently reported at appreciable concentrations in samples collected from monitoring well MW-09, which is located on the DAC C6 property. Chloroform and chlorobenzene have been reported at the highest concentrations in samples from MW-09. In a February 6, 1990 letter from Hargis + Associates, Inc. to the EPA, it was postulated that chloroform present in shallow groundwater in the site vicinity may have originated from an offsite source. The primary objective of the review presented herein was to evaluate the occurrence of chloroform in the subsurface environment at/near the Montrose Site.

3.0 MONTROSE SITE DRAFT REMEDIAL INVESTIGATION REPORT

This section presents a general overview regarding our review comments on the Preliminary Draft Remedial Investigation (RI) report dated October 31, 1990 prepared for the Montrose Chemical Corporation Site in Torrance, California. The RI report was prepared by Hargis + Associates, Inc. (H+A), the technical consultant for Montrose Chemical Corporation. Our comments are presented in general discussion form. Selected review comments are also discussed in other sections of this report, where appropriate.

The RI report documents an attempt to synthesize available information regarding the source(s), nature, extent, and fate of contamination present in the soil, surface water, and groundwater on and near the Montrose Site. According to the RI report, DDT and its metabolites DDD and DDE (hereinafter referred to as DDT), all isomers of benzene hexachloride (BHC), all isomers of dichlorobenzene (DCB), and chlorobenzene were clearly released onsite in considerable volumes as a result of historic site activities. The data discussed do not appear to form an adequate basis, however, for some of the H+A conclusions in the RI report regarding: (1) source(s) of chlorobenzene and chloroform to the environment, (2) the lateral and vertical extent in soil and groundwater of detectable chemicals associated with site activities, or (3) the likely historic unsaturated zone movement of chemicals released at the site.

On the basis of data presented in the RI report, significant spatial and apparent temporal correlations exist between concentrations of chlorobenzene and chloroform in samples from certain groundwater monitoring wells. These data support the hypothesis that chloroform and chlorobenzene were co-released at the site. Given the correlations apparent in the data presented in the RI report, it is clear that the lateral extent of detectable chlorobenzene and chloroform in groundwater has not been established. Further, significant masses of these compounds may be present in the unsaturated zone in areas outside the "Central Processing Area", as defined by H+A. The extent of elevated concentrations of such compounds in the soil which have the potential to continue to impact groundwater has not been adequately examined.

The RI report does not adequately address the mechanisms of movement of aqueous and non-aqueous phase liquids (NAPLs) in the unsaturated zone, nor the movement of dense, non-aqueous phase liquids (DNAPLs) below the water table. On the basis of the RI report it is likely that chemicals released moved downward through the unsaturated zone soils and "rested" on the top of the Bellflower Aquitard described as a "cemented fossiliferous sand". The top of the Bellflower Aquitard reportedly dips northeastward, as shown on the hydrogeologic and soil cross sections (Figures 4.10, 4.11, and 4.12, and 4.5, 4.6, and 4.7) in the RI report. Due to this structural control, chemicals encountering the top of the Bellflower Aquitard would likely migrate toward the northeast (i.e., in the direction of the DAC C6 property). This hypothesis is supported by the reported distribution of DNAPL shown on Figure 5.13 in the RI report.

One additional review comment of possible relevance is the occurrence of increased concentrations of sulfate in samples from certain monitoring wells. The presence of sulfate may be used as a tracer for chemical releases at the Montrose Site. Increased sulfate concentrations may be associated with a direct release of sulfuric acid (which was used in large quantities by Montrose), or may be a product of para-chlorobenzenesulfonic acid (p-CBSA) desulfonation. p-CBSA is a unique synthesis by-product of DDT manufacture and has been used as indicator compound at other DDT by-product release investigations (e.g., Stringfellow Acid Pits, Riverside County, California). The possible correlation between sulfate (and certain other inorganic species) and chemicals known to have been released on the Montrose Site is discussed further in Sections 5.0 and 6.0 of this report.

The spatial correlation between chloroform and chlorobenzene concentrations, and the occurrence of increased concentrations of sulfate in samples from wells which also had increased chloroform and chlorobenzene concentrations, suggests that there was one source of chemical release that resulted in increased concentrations of chloroform and chlorobenzene in shallow groundwater, or if there was more than one source of chemical release, the composition of the released material was similar. The source(s) of these chemical releases appears to be associated with the Montrose Site. The RI report fails to identify plausible alternative sources of the chloroform detected in groundwater samples from the vicinity of the site.

4.0 HYDROGEOLOGIC CONDITIONS EVALUATION

Based on a cursory examination of the groundwater quality and hydraulic data available from the RI for the Montrose Site, it could be concluded that the source of chloroform and chlorobenzene detected in samples collected from monitoring well MW-09 is located to the north of the Site. Using the simplest of hydrogeologic principles this conclusion could be developed based upon the observation that the highest concentrations of chloroform and chlorobenzene reported in the Montrose Site Remedial Investigation (RI) were detected in samples collected from MW-09 (which is located on DAC C6 property, north of the Montrose Site), and because the present-day apparent groundwater flow direction in the Upper Bellflower Aquitard has been observed to be southeastward. However, based upon review of available technical documents and an understanding of the more complex hydrogeologic principles governing subsurface chemical transport in the site vicinity, several factors are apparent (including horizontal chemical transport in the unsaturated zone, stratigraphic orientations, and variable hydraulic conditions) that could account for northward migration of chemicals in the subsurface environment in the site vicinity. This section presents an evaluation of hydrogeologic conditions at/near the Montrose Site.

4.1 Approach

The following hydrogeologic information were reviewed as part of the evaluation presented herein:

- Storm Drain Map (revised 10-25-90), City of Gardena, California.
- Torrance, California 7.5 minute Topographic Map (photo revised 1981), United States Geological Survey.
- Torrance, California 7.5 Minute Topographic Map (1951), United States Geological Survey.
- Existing Storm Drainage Facilities Map (Oct 1988), City of Torrance.
- Drainage Map No. 588 (revised 1-17-73), City of Los Angeles, San Pedro.
- Drainage Map No. 587 (revised 1-87), City of Los Angeles, San Pedro.
- Drainage Map No. 599 (revised 10-85), City of Los Angeles, San Pedro.
- 100 year normal Isohyetal Map, 1972-73 to 1972-73 Los Angeles County, Dept. of Public Works.
- Plan for Flood Control and Water Conservation, Index No. 4 (1985), Los Angeles County, Dept. of Public Works.
- Plan for Flood Control and Water Conservation, Index No. 5 (1985), Los Angeles County, Dept. of Public Works.
- Plan for Flood Control and Water Conservation, Index No. 8 (1985), Los Angeles County, Dept. of Public Works.

- Deep Aquifer Groundwater contour Map, Los Angeles County, Dept. of Public Works.
- Hydrologic Data: 1967, Bulletin No. 130-67, Volume V: Southern California, State of California, Dept. of Water Resources.
- Hydrologic Data: 1963, Bulletin No. 130-63, Volume V: Southern California, State of California, Dept. of Water Resources.
- Hydrologic Data: 1965, Bulletin No. 130-65, Volume V: Southern California, State of California, Dept. of Water Resources.
- Results of Water Quality Monitoring, Water Year 1988-89, Annual Report (4/90), Central and West Basin Water Replenishment District (Bookman-Edmonston Engineering, Inc.).
- Results of Water Quality Monitoring, Water Year 1985-86, Annual Report (3/87), Central and West Basin Water Replenishment District (Bookman-Edmonston Engineering, Inc.).
- Planned Utilization of the Groundwater Basins of the Coastal Plain of Los Angeles County, Appendix A: Groundwater geology, Bulletin No. 104, June 1961, State of California, Dept. of Water Resources.
- Monthly normals of temperature, precipitation and heating and cooling degree days, 1951-80 (Sept 1982), No. 81, National Oceanic and Atmospheric Administration.
- Report and General Soil Map, Los Angeles County, California, (Revised 12/69), United States Department of Agriculture, Soil Conservation Service.
- Master Plan of Drainage, Sept 1987, City of Carson, Department of Public Works.
- Watermaster Service in the West Coast Basin, Los Angeles County, July 1, 1989 - June 30, 1990 (Sept 1990) State of California, Department of Water Resources, Southern District.
- Groundwater Quality and its Impact on Water Supply in the Metropolitan District Service Area, Report no. 969, Jan. 1987, Metropolitan Water District of Southern California.
- West Coast Basin Barrier Project, Hydrologic and Operations Report, March 1989 through August 1989, Los Angeles County, Department of Public Works, Hydraulic/Water Conservation Division.
- Dominguez Gap Barrier Project, Hydrologic and Operations Report, November 1988 through April 1989, Los Angeles County, Department of Public Works, Hydraulic/Water Conservation Division.
- Hydrologic Data: 1985, Bulletin No. 130-85, Volume V: southern California (May 1988) State of California, Department of Water Resources.

- Groundwater Basins in California, Bulletin No. 118, September 1975, State of California, Department of Water Resources.
- Draft Regional Hydrogeologic Assessment Report, Task 15, Volume One, 3/12/1990, Hargis & Associates, Inc.
- Proposed Remedial Action Plan for Carson Estates, Western Avenue Site, Torrance, California (3/7/88), Hydro-Fluent, Inc.
- Supplemental Site Exploration, 20225 S. Western Avenue, Torrance, California (June 4, 1987), Hydro-Fluent, Inc.
- Water Well Records, State of California Department of Water Resources and Los Angeles County Flood Control District. Well records reviewed include: State Well Nos: 3S/13W-31M1, 3S/13W-32E1, 3S/14W-25F3, 3S/14W-25Q2, 3S/14W-26J1, 3S/14W-35A5, 3S/14W-35M5, 4S/13W-5L1, 4S/13W-6K2, 4S/13W-8G2, 4S/13W-18P1, 4S/14W-1F1, 4S/14W-1F2, 4S/14W-1F3, 4S/14W-3L2, 4S/14W-3L3, 4S/14W-3L4, 4S/14W-11E2, 4S/14W-11F1, 4S/14W-11F2, 4S/14W-12Q2, 4S/14W-24A1.

Based upon review of the information listed above, there are several hydrogeologic factors that could account for northward subsurface transport of chemicals released at the Montrose Site. Horizontal transport in the unsaturated zone and stratigraphic orientations appear to be the primary factors (in addition to actual discharge location) affecting chemical distribution in the subsurface environment at/near the Montrose Site. Regional geologic influences (i.e., stratigraphy, surface recharge, and groundwater extraction) also support the feasibility of northward subsurface transport of chemicals released at the Montrose Site. Unsaturated zone transport and pertinent regional geologic influences are discussed in more detail below.

4.2 Unsaturated Zone Transport

Drilling logs presenting the lithologies encountered during the Montrose Site RI indicates that the uppermost approximately 70 feet of sediments at/near the site are unsaturated and consist of interbedded coarse- and fine-grained unconsolidated sediments. The uppermost 25 feet is comprised of Playa deposits, which consist of silts, clay silts, and clays. The lower portion of the Playa deposits grade from silt to fine sand. The Palos Verdes Sand, a fine to silty type sand, is encountered to about 45 feet below ground surface (bgs). A well-cemented fossiliferous sand was consistently observed at the base of the Palos Verdes Sand, between 30 and 45 feet bgs. The Upper Bellflower Aquitard, which consists of fine sand and silty sand interbedded with silt and clay beds, extends from about 45 to 70 feet bgs.

Plotting the depth to occurrence of the fossiliferous sand indicates that this unit dips to the north on an angle of approximately one and one-half degrees from horizontal beneath the Montrose Site (see Figure 4-1). Because of the cemented nature of the fossiliferous unit and the implication that other strata beneath the site also dip to the north, structurally-influenced migration to the north of liquids percolating downward in the unsaturated zone to the water table is a viable hypothesis. Liquids released at the surface and transported downward in the unsaturated zone would likely spread laterally

once encountering the top of this fossiliferous sand, and then migrate horizontally northward, following the stratigraphic dip of this unit. Horizontal migration in the unsaturated zone could account for offsite occurrence of chemicals released at the Montrose Site, and the apparent prevailing northward dip indicates that there is a significant probability that lateral migration in the unsaturated zone is toward the north (i.e., toward the DAC C6 property).

Infiltration through unsaturated zone sediments under constant head conditions (e.g., steady leakage from the unlined wastewater settling pond) would produce a recharge mound protruding into the surrounding unsaturated zone above the water table. The recharge mound likely produced by releases from the settling pond at the Montrose Site could have resulted in appreciable nonsteady-state horizontal flow of pond discharges through the surrounding unsaturated zone, and also have been sufficient to locally alter the uppermost groundwater flow patterns. The phenomena would have resulted in northward subsurface migration of chemicals released on the Montrose Site. Chemical transport in the unsaturated zone at/near the site is discussed further in Section 5.0.

4.3 Regional Hydrogeologic Influences

Potential regional influences on the subsurface chemical transport include stratigraphic orientations, surface recharge, and groundwater extraction. Each of these influences are discussed further below.

4.3.1 Stratigraphic Orientations

The Montrose Site is underlain by a northwest-trending structural fold system. The site is located between the Torrance Anticline and the Gardena Syncline (see Figure 4-2). Locally, the underlying lithologic units have been deformed by tectonic forces into the northeast-dipping homocline that slopes gently from the apex of the Torrance Anticline to the trough of the Gardena Syncline (California Department of Water Resources, June 1961). A north-south trending regional lithologic cross-section located approximately 3/4-mile west of the site shows that the "undivided Upper Pleistocene deposits" (i.e., the Bellflower Aquitard) dips toward the north in the Torrance area, which is consistent with the dip of the homocline (Poland et al., 1959).

The north dip of the cemented fossiliferous sand unit in the Upper Bellflower Aquitard that was determined during this review using Montrose RI information, is consistent with the regional dip of the Bellflower Aquitard, as discussed above. Considering this characteristic of the regional structural geology and using generally-accepted principle of stratigraphic interpretation, it is reasonable to infer that the other lithologic units making up the Upper Bellflower Aquitard dip toward the north. Chemical transport in the unsaturated zone in the site vicinity is probably structurally controlled. In other words, aqueous solutions percolating downward through the unsaturated zone and encountering lithologic interfaces (e.g., an interface between a sand and a clay unit) would likely migrate horizontally along the interface in the direction of the stratigraphic dip. This type of transport would account for the occurrence of chemicals released on the Montrose Site in the subsurface to the north of the site.

4.3.2 Surface Recharge

Natural replenishment of the West Coast Basin is primarily limited to underflow from the Central Basin, which bounds the West Coast Basin on the east. Artificial recharge to the West Coast Basin is accomplished by injection of fresh water into a line of injection wells that parallels the coastline. These injection areas include the West Coast Barrier Project (which extends along the coast from El Segundo to Redondo Beach) and the Dominguez Gap Barrier Project (which is located near the mouth of the Los Angeles River in San Pedro). This injection is into deeper water-bearing zones and may not directly affect hydraulic conditions in shallow aquifers. Much of the injected water flows from the coast toward the interior of the basin, creating a eastward regional groundwater flow direction. The groundwater flow direction in the Upper Bellflower Aquitard in the vicinity of the Montrose Site has been reported as southeastward during Hargis + Associates sampling rounds. Observed groundwater flow directions during March 1987 and May 1989 sampling rounds are shown in Figures 4-3 and 4-4, respectively.

Local surface recharge (i.e., infiltration of rainwater) in the vicinity of the Montrose Site occurs mainly to the south and west of the site. Earthen-bottom retention basins and diversion channels are located throughout the City of Torrance, to the south and west of the site. Surface water in the City of Gardena and other areas to the north and east of the site is primarily diverted through concrete-lined flood control channels, which are directed to the Dominguez Channel and from there discharged to the Pacific Ocean. Basin recharge at the locations of earthen retention basins and diversion channels can produce saturated recharge mounds locally. Because most of the local basin recharge occurs to the south and west of the site, recharge mounds could temporarily reverse the southeastward regional shallow groundwater flow direction locally.

Many of the unlined flood control features described above are located in the areas where the Bellflower Aquitard contains a high amount of sand and gravel (California Department of Water Resources, June 1961). The rate of infiltration at these areas would be greater than at locations where the aquitard is comprised of more fine-grained sediments. The Bellflower Aquitard, which comprises the uppermost lithologic unit in the Torrance area, varies significantly in the proportions of fine- to coarse-grained material, and in some areas, is nonexistent. In the areas toward the west and south of the facility, and as close as one-half mile to the south of the facility, the Bellflower Aquitard contains a significantly higher proportion of coarse-grained (i.e., sand and gravel) material than that underlying the site and areas toward the north and east (see Figure 4-2). In addition, an area located approximately 2.5 miles west of the facility is completely devoid of the Bellflower Aquitard (see Figure 4-2). The underlying aquifers are exposed at the ground surface in this location. These features support the premise that basin recharge occurs to a greater extent in areas to the south and west of the Montrose Site than in areas to the north and east, and because of this, local reversal of the regional southeastward shallow groundwater flow direction could occur.

Other potential recharge locations include industrial dry wells areas and railroad tracks. Ballast beneath railroad spurs are designed to facilitate rapid drainage of rainwater from the overlying track and, hence, appreciable recharge can occur along the tracks, particularly in an industrial setting where much of the surrounding land is typically paved to promote rapid runoff.

Dry wells can also be areas of recharge to shallow groundwater. Up until five or ten years ago, discharge of industrial wastewater was commonly achieved through use of dry wells. A dry well is a hole excavated in unsaturated porous media and typically filled with gravel or loose rock. Water is discharged to a dry well and allowed to percolated downward. During the review of records of nearby properties, it was noted that two businesses had applied for industrial waste discharge permits to operate dry wells. The two businesses are Jones Chemical, located at 1401 West Del Amo Boulevard in Los Angeles, and Amoco Chemicals, located at 1225 West 196th Street in Torrance. The locations of these two properties are shown in Figure 2-1 and site descriptions are summarized in Table 2-1. The dry wells at Jones Chemical and Amoco Chemicals were permitted by the City of Los Angeles Bureau of Sanitation in 1981 and 1963, respectively. Information pertaining to the operating duration of these dry wells was unavailable.

4.3.3 Groundwater Extraction

The majority of the groundwater extracted from the West Coast Basin is pumped from deeper aquifers (i.e., Lynwood and Silverado Aquifers). Due to this pumping, groundwater in these deeper aquifers typically occur under lower pressures than in the shallower aquifers. For instance, groundwater levels in Montrose Site wells that are screened in the Upper Bellflower Aquitard, Bellflower Sand, and Gage Aquifer are about 10 feet higher than water levels in wells that are screened in the Lynwood Aquifer. These vertical gradients create a potential for downward flow of groundwater from the shallow saturated zones to the deeper zones. The nearest, appreciable groundwater pumping center (i.e., greater than 600 acre-feet extracted annually) is operated by Mobil Oil Corporation and is located approximately two miles west of the site (i.e. between Crenshaw and Hawthorne Boulevard and south of 190th Street).

Available, regional well records were reviewed, but differences in observation dates, lack of ground surface elevations, and differences in perforated depths made it difficult to evaluate historic changes in groundwater flow directions in the regional aquifers. Also, very little data were available for wells completed in shallow aquifers. Very few production wells have been completed or are active in the shallow aquifers in the West Coast Basin, due to low yields or poor water quality. Although detail analysis is not possible given the quality of the data available, it appears unlikely that groundwater extraction from deeper aquifers at the locations of active pumping centers would significantly affect the horizontal groundwater flow direction in the shallow groundwater beneath the DAC C6 and Montrose properties.

5.0 CHEMICAL FATE AND MOBILITY EVALUATION

This section presents the findings of a chemical fate and mobility evaluation, which was conducted to examine possible physical/chemical mechanisms that could account for the occurrence of chloroform in shallow groundwater beneath the DAC C6 property.

5.1 Approach

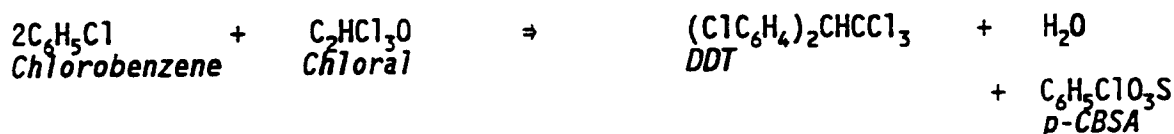
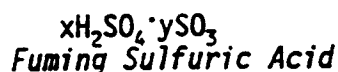
The chemical and fate and mobility evaluation presented herein includes consideration of chemical use and waste generation/disposal at the former Montrose Chemical facility; review of reported chemical occurrence in the unsaturated and upper saturated zones at/near the Montrose Site; and evaluation of possible chemical transport and transformation processes that might account for the occurrence of chloroform in shallow groundwater.

5.2 Montrose Chemical Use and Waste Generation and Disposal

Montrose produced dichlorodiphenyltrichloroethane (DDT) at its Torrance, California facility from 1947 until late 1982. Technical grade DDT was produced as "Krisp Chips" and packaged in 50 pound bags. During the period of approximately 1965 to 1982, a substantial portion of the technical grade DDT was ground into a fine powder and mixed with inert ingredients to form a water dispersible powder that contained approximately 75 percent DDT by weight. Total DDT production rates during the period of operation of the facility ranged from less than one million pounds per month to over six million pounds per month.

DDT was produced at the Montrose plant by reacting chlorobenzene and chloral (in a ratio of approximately two moles of chlorobenzene to one mole of chloral) in the presence of strong sulfuric acid in a number of temperature-controlled batch reactors. This reaction is outlined below.

DDT SYNTHESIS



Once the reaction was complete, the resultant DDT-sulfuric acid slurry was pumped to a rotary vacuum filter to separate the DDT and the majority of the acid. The DDT filter cake was then subjected to high temperatures, melted, and sent to acid-DDT separator vessels where additional acid was removed. The molten DDT then flowed to a vessel where residual acid was neutralized with a dilute solution of sodium hydroxide. The DDT and alkaline wash water were separated, the DDT was washed again with hot water, and finally the DDT was poured onto large metal turntables where it was allowed to cool, crystallize, solidify, and be scraped off to form chips of technical grade DDT.

The sulfuric acid from the vacuum filter was recycled and reused, while sulfuric acid from the acid-DDT separator was sent through a separate process where para-chlorobenzenesulfonic acid (p-CBSA) was removed and converted to chlorobenzene and sulfuric acid, and the chlorobenzene was recycled. This desulfonation of p-CBSA was conducted under high temperature conditions. The waste sulfuric acid from the process was either disposed as hazardous waste or sold for the manufacture of fresh acid or fertilizers. Due to the presence of residual sulfuric acid, wastewater generated from the DDT manufacturing process was typically neutralized with sodium hydroxide before being discharged.

The alkaline wastewater was settled and discharged to the sanitary sewer before about 1970; after that time, this wastewater was collected and disposed as hazardous waste. Wastewater settling was achieved in a large settling pond located in the middle of the facility (see Figure 5-1). The pond was unlined until about 1970, at which time it was lined with concrete. The time when the pond was lined (i.e., 1970) was coincident with the time when sewer discharge of alkaline wastewater was discontinued. Subsequent to 1970, the pond was used for process water recycling. Both the acid and alkaline wastewaters typically contained some DDT, non-reacted raw materials, and reactor by-products (e.g., p-CBSA).

The chlorobenzene and a chlorobenzene/chloral "mix" (which was delivered in liquid form) were received by rail tank car and truck. These materials were unloaded and stored in 50,000 gallon tanks on the southern portion of the property or in 10,000 gallon tanks just east of the DDT process building, at the northern portion of the property (see Figure 5-1). Other raw materials received and stored in bulk included fuming sulfuric acid (65 percent oleum) stored just east of the DDT process building, 50 percent sodium hydroxide stored north of the settling pond, and lime (Ca(OH)_2) stored south of the alkaline waste storage tank.

5.3 Subsurface Chemical Occurrence

The Montrose Site Remedial Investigation (RI) includes evaluation of chloroform occurrence in the unsaturated zone sediments and the following four saturated units (listed from uppermost to deepest):

- Upper Bellflower Aquitard
- Bellflower Sand
- Gage Aquifer
- Lynwood Aquifer

The four monitoring wells (MW-08, MW-09, MW-18, and MW-19) installed to date on the DAC C6 property are screened in the Upper Bellflower Aquitard. Accordingly, the focus of this review is primarily on chemical occurrence in the unsaturated zone and the uppermost saturated zone (i.e., the Upper Bellflower Aquitard). Available groundwater quality data on the Bellflower Sand unit were also reviewed.

The following section presents a review of the findings from the Montrose Site RI, regarding the distribution of chloroform and other DDT-production related compounds in the unsaturated zone, and the Upper Bellflower Aquitard and Bellflower Sand saturated zones.

5.3.1 Organic Chemicals

This review focused primarily on evaluating chemical occurrence in the Upper Bellflower Aquitard. The two chemicals of particular interest because they were consistently detected together are chloroform and chlorobenzene.

The primary potential source area on the Montrose Site for chemical release to the subsurface environment appears to be the former central process area, which included the DDT manufacturing building, process equipment, wastewater recycling pond, acid recovery area, and several above-grade storage tanks. Chlorobenzene and chloroform concentrations in soil samples collected during the site RI were reportedly the highest in samples from borings placed in the former central process area. The highest reported chloroform concentration was 72 milligrams per kilogram (mg/kg) in a sample collected from boring 14D at a depth of 9.0 to 9.5 feet below ground surface (bgs). The highest reported chlorobenzene concentration was 16,000 mg/kg in a sample collected from boring 24D at a depth of 9.5 to 11.0 feet bgs. Soil borings 14D and 24D were both drilled within the central process area less than 200 feet from each other (Hargis + Associates, Inc., October 31, 1990).

The concentrations of chlorobenzene correlate well with those of chloroform among samples collected from most monitoring wells completed in the Upper Bellflower Aquitard in the vicinity of the Montrose Site (see Figure 5-2). Concentrations of chlorobenzene and chloroform in samples collected during the years 1989 to 1991 are presented in Table 5-1. As shown by these data, chloroform generally occurs concurrently with chlorobenzene, and the concentrations of chloroform are high in samples with appreciable chlorobenzene concentrations.

The ratio of chlorobenzene concentrations to those of chloroform is generally close to 2:1 among wells with appreciable concentrations of the two chemicals. Coincidentally, this ratio is equivalent to the chlorobenzene to chloral molar ratio used by Montrose Chemical. The stoichiometry of chloral hydrolysis is one mole of chloral yielding one mole of chloroform (see Section 5.5). Conversion from the mass concentrations (i.e., $\mu\text{g/L}$ as presented in Table 5-1) to molar concentrations would not make a significant difference in comparing the ratio of the two chemical concentrations, because the molecular weight for chlorobenzene is similar (within roughly five percent) to that of chloroform; the molecular weights of chloroform and chlorobenzene are 119.39 and 112.56, respectively. These relationships between chloroform and chlorobenzene occurrence in groundwater indicate that the same process (or source) accounted for the presence of both chemicals in the Upper Bellflower Aquitard.

Chloroform has been consistently detected at appreciable levels (i.e., concentrations approximately 1,000 $\mu\text{g/L}$ and greater) in samples from monitoring wells MW-01, MW-05, MW-06, MW-09, MW-11, MW-12, and MW-13. Limited groundwater quality data are available for monitoring well MW-02, which is located at the approximate location of the former wastewater settling pond on

the Montrose property. Sampling of this well has been conducted on an infrequent basis because dense, non-aqueous phase liquid (DNAPL) present in it has reportedly deteriorated downhole sampling equipment (personal communication, Hargis + Associates, Inc., January 1991). An April 1988 sample of water column above the DNAPL in MW-02 had 8,500 $\mu\text{g/L}$ of chloroform, and an aqueous sample from MW-02 collected by Kennedy/Jenks/Chilton in February 1991 had 5,300 $\mu\text{g/L}$ of chloroform (see Section 6.0). DNAPL was also collected from well MW-02 in February 1991 and this liquid contained 800,000 $\mu\text{g/L}$ of chloroform. The presence of chloroform in this DNAPL strongly supports a conclusion that the Montrose property is a source of dissolved chloroform to shallow groundwater.

Based on the results of the DNAPL and associated aqueous phase analyses described above, it is apparent that chloroform is more soluble in the DNAPL than in water. It is reasonable to conclude that the DNAPL behaves similarly to chlorobenzene; chlorobenzene makes up nearly 70 percent of the DNAPL (see Section 6.3.4). The ratio of the concentration of chloroform in the DNAPL to that in the aqueous phase (i.e., approximately 150 to 1) is consistent with what would be estimated based upon the octanol/water partition coefficient (K_{ow}) for chloroform, which is 93.3 (USEPA, October 1986). The K_{ow} for chloroform is a reasonable estimate of the chlorobenzene/water partition coefficient for chloroform. In fact, the observed ratio of 150 would be expected to be slightly greater than the K_{ow} of 93.3, because chloroform would be predicted to be moderately more soluble in octanol than in chlorobenzene, due to the slight polarity of octanol.

As discussed below in Section 5.4, the occurrence of chloroform at appreciable concentrations in samples from offsite wells suggests that chloroform was released in aqueous form. Migration of DNAPL would not be expected to be as laterally extensive as aqueous phase migration. Due to differences in viscosity and surface tension, DNAPL transport is commonly slower than transport of the aqueous portion of a groundwater plume. Chlorobenzene was probably also released in aqueous form, because the distribution of this compound is highly correlated to the distribution of chloroform.

5.3.2 Inorganic Chemicals

The inorganic chemical quality of a sample collected from monitoring well MW-09 in May 1989 was distinct from the inorganic chemical quality in a sample from cross-gradient well MW-08 collected during the same sampling event (see Table 5-2). The concentration of each measured inorganic chemical was considerably greater in the MW-09 sample than in the sample from MW-08. The increased concentrations of inorganic compounds in the Upper Bellflower Aquitard at the location of monitoring well MW-09 may be related to chemical releases to the subsurface at the Montrose property.

Hargis + Associates have reported considerable differences in inorganic chemical quality among wells completed in the Upper Bellflower Aquitard (Hargis + Associates, Inc., October 31, 1990). As discussed in Section 6.3, a water sample from monitoring well MW-02 reportedly contained appreciable concentrations of inorganic compounds. The central process area, particularly the former wastewater settling pond, may have been a source area for inorganic chemical releases and these releases may have coincided with organic chemical

releases. For example, Montrose used large amounts of sulfuric acid and generated large quantities of sulfuric acid waste. Sulfuric acid releases to groundwater would account for increased concentrations of sulfate. Other inorganic chemicals used by Montrose include sodium hydroxide (NaOH) and lime ($\text{Ca}(\text{OH})_2$). The possible relationship between inorganic and organic chemical releases at the Montrose Site is discussed further in Section 6.4.

5.3.3 Potential Groundwater Sampling Uncertainties

In reviewing groundwater chemical concentration data obtained from sampling shallow (uppermost saturated zone) groundwater monitoring wells, it is important to note that a number of factors may create uncertainties as to the true representativeness of the monitoring results in terms of the actual overall distribution of chemical concentrations in the uppermost saturated zone. At the Montrose Site, and its immediate vicinity, this is particularly true for wells completed in the Upper Bellflower Aquitard. Differences in monitoring well screen length and water table fluctuations may have a significant impact on the representativeness of the data.

Major groundwater monitoring factors that create uncertainties in the case of the Montrose RI include:

- (1) If chemical concentrations are vertically stratified within the uppermost saturated zone (which is often the case when concentrated chemical solutions/liquids are released in fine-grained sediment), the length of the well screen penetrating the saturated zone will have a significant impact on the chemical concentration in groundwater samples collected from the well. For example, if a well that is constructed with a longer wetted screened section penetrates the saturated zone at an area where only the first few feet of the uppermost saturated zone contains high chemical concentrations, appreciable dilution of the sample collected may occur as a result of groundwater inflow from lower, less contaminated saturated sediments. However, a well constructed with a shorter wetted screen in the same area would produce groundwater samples containing significantly higher chemical concentrations.

As shown in Table 5-3, the wetted screen lengths among wells completed in the Upper Bellflower Aquitard were considerably different on 16 April 1990, ranging from 6.47 feet for MW-3 to 19.43 feet for MW-24.

- (2) Minor variations in the textural characteristics of the saturated sediments screened by a particular monitoring well will alter the permeability of the surrounding formation and, hence the way in which water flows into the well during purging and sampling at a given discharge rate. For example, if a well recharges slowly during pumping, appreciable drawdown in the well may occur resulting in water from the surrounding formation "cascading" through the well's filter pack before entering the casing. Such cascading may result in the loss of volatile compounds contained in the groundwater into the air within the well and bias the analytical result downward. Monitoring programs such as the Montrose RI, involve sampling many wells, each with individual pumping characteristics.

- (3) As the water table rises and falls in fine-grained sediments in the vicinity of a chemical discharge, soil pores "flushing" occurs at different rates and in an irregular pattern. Accordingly, it is possible to detect higher chemical concentration in groundwater that occurs at some distance from the original source area as a result of such differential sediment flushing.

5.4 Chemical Transport

As discussed in Section 4.0 of this report, the unsaturated zone sediments at the site are comprised of interbedded sands, silts, and clays. Chemical transport through these heterogeneous sediments would be expected to result in an irregular chemical distribution pattern. Horizontal migration of aqueous solutions and liquids with similar characteristics to water would be significant in fine-grained zones and at textural interfaces, along which migrating liquids would tend to follow stratigraphic orientations. For instance, as discussed in Section 4.0, a well-cemented fossiliferous sand unit was consistently reported at the Montrose Site between 30 and 40 feet bgs. Liquids released at the surface and transported downward in the unsaturated zone would likely spread laterally once encountering the top of this fossiliferous sand, and then migrate horizontally northward, following the stratigraphic dip of this unit. There would also be a degree of downward liquid movement (i.e., infiltration) through the fossiliferous sand, depending on the permeability of the unit to the particular liquid.

In addition to textural and stratigraphic characteristics, unsaturated zone transport is a function of chemical properties and the nature of the release. Physicochemical processes, such as sorption to soil particles and volatilization, affect chemical transport in unsaturated sediments. "Stagnant" zones are also an important component of unsaturated zone transport. Due to phenomena such as dead-end pores and capillary traps, a significant portion of liquids in unsaturated sediments are typically immobilized (i.e., stagnant) from the flow process. Although stagnant liquids are essentially removed from advective flow, solutes in these liquids can diffuse to surrounding soil pores under chemical gradients in soil gas or soil water.

The nature of the release also affects unsaturated zone transport. Infiltration under constant hydraulic head conditions (e.g., steady leakage from the unlined wastewater settling pond) would produce a steady-state saturated recharge mound protruding upwards into the surrounding unsaturated zone. The shape of the recharge mound would be a function of the textural characteristics of the unsaturated zone sediments. At/near the Montrose Site, appreciable lateral movement or spreading away from the point of introduction would likely occur. Water-table mounding that takes place beneath impoundments like the wastewater settling pond will tend to reverse groundwater flow directions locally.

Intermittent and/or incidental surface releases of aqueous solutions typically result in non-steady flow through unsaturated sediments. Liquids released in this manner generally migrate along localized, structurally- or texturally-preferred paths, and are commonly attenuated over short distances by the moisture retention capacity of the soils.

Another consideration at/near the Montrose Site is transport of immiscible liquids. Hargis + Associates, Inc. have consistently reported dense, non-aqueous phase liquid (DNAPL) in monitoring well MW-02 and postulate that DNAPL occurs over an area extending several hundred feet east and north of the former central process area at the Montrose facility (Hargis + Associates, Inc., October 31, 1990). Differences in chemical properties, such as specific gravity, viscosity, and surface tension, between DNAPL and aqueous solutions produces differences in transport behavior. As with aqueous solutions, DNAPL migrating through unsaturated and saturated sediments commonly leave residual portions trapped in pore spaces due to capillary tension or the presence of dead-end pores. Dissolution of DNAPL from these trapped portions can often be a long-term source of contamination.

The occurrence of DDT in shallow groundwater at the site has been attributed to DNAPL transport (Hargis + Associates, Inc., October 31, 1990). It has been postulated that DDT, which is essentially insoluble in water, was dissolved into DNAPL (which mostly contains chlorobenzene) and transported downward to the uppermost saturated zone. Chloroform could have also dissolved into DNAPL material and transported to the subsurface, "entrained" in the DNAPL. Indeed, chloroform was detected at 800,000 $\mu\text{g/L}$ in a DNAPL sample collected in February 1991 from monitoring well MW-02 (see Section 6.3.4).

Chloroform was probably transported to the subsurface both in an aqueous solution and dissolved in DNAPL. As discussed below in Section 5.5, chloral, a major raw material used by Montrose, transforms to chloroform by hydrolysis. This hydrolysis could have occurred in alkaline solutions within process or waste storage vessels. The chloroform formed under such conditions could have subsequently been discharged to the subsurface via the unlined settling pond or at other locations. Chloral is also readily soluble in water, forming chloral hydrate (The Merck Index, 1983). Thus, a substantial quantity of chloral was probably released to the subsurface on the Montrose property in aqueous solution during the active life of the production plant, and transformation to chloroform could have occurred in the unsaturated zone and/or in shallow groundwater. Because the spatial distribution of chlorobenzene occurrence is closely related to that of chloroform in the Upper Bellflower Aquitard, one can reasonably conclude that chlorobenzene was released in aqueous form.

The most important unsaturated zone transport phenomena at/near the Montrose Site that affect chemical distribution in the uppermost groundwater appear to be horizontal migration through fine-grained sediments and structurally-controlled migration along stratigraphic interfaces. The north dip of the fossiliferous sand unit (and plausibly other stratigraphic units in the unsaturated zone) probably influences the direction that liquids migrate in the unsaturated zone. This could explain the occurrence of chloroform and chlorobenzene in shallow groundwater in the vicinity of monitoring well MW-09, which is located north of the Montrose property.

Based upon the reported spatial distribution of chemicals in the Upper Bellflower Aquitard, chemical transport in this saturated zone appears diffusive. Groundwater velocities in this zone are reportedly very slow and, thus, chemical transport in the uppermost groundwater is probably more influenced by chemical diffusion than by hydraulic forces.

Because the groundwater gradient in the Upper Bellflower Aquitard is essentially flat, local hydraulic perturbations or stresses could cause shifts in the prevailing groundwater flow direction. For instance, a recharge mound beneath the former wastewater settling pond could reverse the local flow direction. As discussed in Section 4.3.2, unlined surface water retention basins and earthen flood control channels are historically and currently more prevalent to the south of the Montrose Site than to the north and, thus, surface recharge to shallow groundwater probably occurs at greater rates to the south. The north "slopes" of these recharge mounds could reverse the general southeastward groundwater flow direction in the vicinity of the Montrose and DAC C6 properties. Other potential factors affecting hydraulic conditions are discussed in Section 4.3.

Therefore, in addition to lateral transport in the unsaturated zone, diffusive chemical transport and hydraulic perturbations in the uppermost groundwater could account for chloroform occurrence in the Upper Bellflower Aquitard beneath the DAC C6 property, i.e., at a location technically hydraulically upgradient from the Montrose Site. The fact that chloroform concentrations are correlatable to chlorobenzene concentrations further supports the conclusion that chemicals migrated northward from the Montrose Site; chlorobenzene was indisputably released by Montrose.

5.5 Chemical Transformations

An important consideration of this review is the potential for transformation of chemicals formerly used and/or released to the environment at the Montrose property. Probably the most important potential transformation reaction considered in this review is chloral hydrolysis, which is illustrated below.

CHLORAL HYDROLYSIS



As shown above, chloral, a major raw material used by Montrose Chemical, can potentially transform to chloroform. Chloral hydrolysis occurs most rapidly under alkaline conditions. This reaction could have occurred at the Montrose facility during the caustic DDT wash, where residual chloral might have been present. Alternatively, chloral could have been released to the subsurface at/near chemical storage areas and transformed to chloroform in the subsurface. This subsurface transformation could have been accelerated if alkaline solutions (e.g., released from the wastewater settling pond) came into contact with chloral in the unsaturated zone or uppermost saturated zone.

Chloral hydrolysis at/near the Montrose Site is probably not restricted to occurring under only alkaline conditions. Although the rate of chloral hydrolysis under near-neutral pH conditions is slower than under high pH conditions, the reaction could be rapid enough at near-neutral conditions to occur in a time frame encompassing decades. Considering the probable duration of chemical releases at the Montrose Site (the facility was in operation for 35 years), there was ample time for the reaction to occur under near-neutral pH conditions.

The principal volatile organic compounds (VOCs) of concern (i.e., chloroform and chlorobenzene) do not appear to be undergoing significant transformation in the shallow groundwater. Chloroform and chlorobenzene have been consistently detected in groundwater samples from many of the Montrose Site monitoring wells for three to four years and, for some wells, five to six years. The concentrations of these compounds have generally not varied considerably with respect to time. These compounds can potentially be degraded, but site-specific factors, such as ambient environmental conditions (i.e., redox, temperature, pH), available electron acceptors, or appropriate microbial populations, do not appear favorable for transformation of these compounds.

Another transformation reaction of interest is desulfonation of para-chlorobenzenesulfonic acid (p-CBSA). p-CBSA is a unique by-product of DDT manufacturing and is formed when chlorobenzene is mixed in the presence of fuming sulfuric acid. Transformation of this compound is important because p-CBSA is considered to be a unique indicator compound for contamination traceable to chemical releases associated with DDT manufacturing (Sittig, 1980; Kim et al., 1990).

p-CBSA is a nonvolatile, highly polar compound that ionizes readily in water to para-chlorobenzenesulfonate. Microbial desulfonation of p-CBSA is improbable. Laboratory and field studies of linear alkyl-benzenesulfonates (LAS) in aerobic systems have shown repeatedly that microorganisms favor breakdown of the hydrocarbon side chain (via ω -oxidation and progressive β -cleavage, for example) over removal of the sulfonate group during primary biodegradation (Eganhouse et al., 1983). This leads to the formation of various sulfophenylcarboxylic acids as transient intermediates. Oxidative metabolism of LAS by reductive desulfonation, therefore, seems highly unlikely.

Chemical desulfonation can occur because of the reversibility of the sulfonation/desulfonation reaction. Under high temperature (100-175°C) and acidic conditions, formation of the free hydrocarbons from the corresponding sulfonates is promoted (Eganhouse et al., 1983). Montrose Chemical, for example, desulfonated p-CBSA under high temperature conditions to recover chlorobenzene. This reaction is outlined below.

p-CBSA DESULFONATION



No information is available documenting the occurrence of the p-CBSA chemical desulfonation in the subsurface under ambient environmental conditions. Although this reaction is thermodynamically possible, the rate of the reaction (i.e., kinetics) under typical pH and temperature conditions of natural systems is probably very slow. However, given the probable duration of chemical release at the Montrose Site, some desulfonation of p-CBSA may have occurred in the subsurface environment.

6.0 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater samples were collected from existing monitoring wells at/near the Montrose Site and analyzed to evaluate whether chloroform and chlorobenzene in shallow groundwater in the vicinity of the DAC C6 Facility occurs in conjunction with p-CBSA, an "indicator compounds" associated with DDT manufacturing processes. This section presents the methodology and findings of this groundwater sampling and analysis investigation.

6.1 Approach

Groundwater sampling was conducted in wells completed in the uppermost saturated zone (i.e., the Upper Bellflower Aquitard). This investigation was primarily focused on the Upper Bellflower Aquitard because this saturated zone is where each of the monitoring wells on the DAC C6 property are screened and where the highest concentrations of chloroform and chlorobenzene have been detected. The fifteen wells shown on Figure 6-1 were selected for sampling based on a review of previous analytical results and in order to provide a geographically broad, lateral sampling domain for the apparent affected area of the uppermost saturated zone.

Groundwater samples were analyzed for para-chlorobenzenesulfonic acid (p-CBSA); chloroform, chlorobenzene, and other volatile organic compounds; and certain inorganic species and parameters. As discussed in Section 5.0, p-CBSA is formed during DDT manufacturing when chlorobenzene is mixed with fuming sulfuric acid. At former disposal sites (e.g., Stringfellow Acid Pits, Riverside County, California), p-CBSA has been considered to be a reliable indicator compound for groundwater contamination related to chemical wastes from the DDT manufacturing process.

Review of Montrose Site reports prepared by Hargis & Associates indicated that concentrations of certain major inorganic species (including chloride, bicarbonate, sulfate, calcium, magnesium, potassium, and sodium) were considerably higher in a groundwater sample collected from monitoring well MW-09 than in the sample collected during the same sampling event from monitoring well MW-08 which is located hydraulically "cross-gradient" from MW-09. The distinct inorganic chemical quality of groundwater collected from MW-09 could potentially be the result of discharges to the subsurface of chemicals at the Montrose Site. For instance, the presence of increased concentrations of sulfate could be associated with releases of sulfuric acid, which was used in large quantities by Montrose.

An additional component of this investigation involved collecting dense, non-aqueous phase liquid (DNAPL) from monitoring well MW-02 and evaluating the composition of the DNAPL (particularly whether it contained chloroform). Monitoring well MW-02 is located at the approximate location of the former wastewater settling pond on the Montrose property. This location is a potential source area for chemical releases, and DNAPL has been previously observed in samples collected from this well.

6.2 Methodology

The fifteen (15) existing monitoring wells selected at/near the Montrose Site were sampled on January 30, January 31, and February 1, 1991. This section presents the procedures used for groundwater sampling and analysis.

6.2.1 Sampling

Groundwater sampling information and field measurements/observations are summarized in Table 6-1.

Each of the monitoring wells, except MW-02, was previously fitted with dedicated purging and sampling pumps. The dedicated pumps in the Montrose Site wells are QED Environmental Systems, Inc. "Well Wizard" equipment. Monitoring well MW-02 did not have a dedicated pump at the time of sampling; the free product present at this well location reportedly deteriorated the discharge tubing of a downhole pump a few years ago. The pump was removed and this well has been left without a dedicated pump since that time.

A portable, self-contained air compressor and control box was used to purge and sample the wells fitted with dedicated pumps. Hargis & Associates, Inc. provided teflon-lined sampling tubes for each well. Grab samples of DNAPL and water were collected from monitoring well MW-02 without purging.

The monitoring wells were sampled in order of ascending detected concentrations of chloroform and chlorobenzene (i.e., lowest to highest detected concentrations in samples collected by Hargis & Associates, Inc. during the most recent sampling round of the Montrose Site wells). The wells were sampled in this order to reduce the potential for cross-contamination between wells.

Static groundwater levels were measured in each of the wells (except MW-02) prior to purging. The wells were purged until temperature, pH, and electrical conductivity were stable (i.e., the values for three consecutive measurements were within 10 percent of each other), and at least three casing volumes of groundwater had been removed. Groundwater samples were collected in appropriate containers and stored upright in "blue ice"-cooled chests (i.e., cooled to 4°C) pending shipment to an analytical laboratory. Samples were delivered to the appropriate laboratory within 48 hours of collection. EPA-recommended chain-of-custody documents were transported with the samples to the analytical laboratories. Copies of the chain-of-custody documents are contained in Appendix A.

The following quality assurance/quality control (QA/QC) samples were collected:

- DUPLICATES: Two duplicate samples were collected and analyzed for each constituent specified in Section 6.2.2. The duplicates were numbered as follows: DUP1-K1 collected from monitoring well MW-08 and DUP2-K1 collected from monitoring well MW-05.
- FIELD BLANKS: Two field blanks were collected and analyzed for each constituent specified in Section 6.2.2.

FIELD SPIKES: A duplicate sample from monitoring well MW-11 was spiked in the field with a solution containing the following compounds at the identified concentrations: chloroform (1,000 µg/L) and tetrachloroethylene (100 µg/L).

TRAVEL BLANKS: During each day of sampling, a travel blank was transported with the samples to the analytical laboratory and analyzed for volatile organic compounds (EPA Method 8240).

Additional groundwater was also collected from monitoring well MW-01 to provide sufficient volume for laboratory QA/QC tests.

Purge water was stored on DAC C6 property in 55-gallon DOT-approved, open-top drums.

6.2.2 Analysis

Groundwater samples were analyzed by laboratories certified by the California Department of Health Services to perform hazardous waste analyses. Laboratory analyses included the following:

Volatile Organic Compounds using gas chromatography/mass spectroscopy (GC/MS) (EPA Method 8240). Kennedy/Jenks/Chilton Laboratory Division, San Francisco, California performed these analyses.

para-chlorobenzenesulfonic acid (p-CBSA), using an ion chromatographic (IC) procedure developed by the California Department of Health Services, Hazardous Materials Laboratory, Berkeley, California. A GC/MS procedure developed by West Coast Analytical Services, Inc., Santa Fe Springs, California was used for confirmation (see Appendix B). West Coast Analytical Services, Inc. performed the IC and GC/MS analyses.

Certain Inorganic Species and Parameters, including pH, specific conductance, total dissolved solids (TDS), total alkalinity, total hardness, sulfate, chloride, bicarbonate, nitrate, calcium, magnesium, potassium, and sodium, using procedures published in: "Standard Methods for the Examination of Water and Wastewater", American Public Health Association; or equivalent. Kennedy/Jenks/Chilton Laboratory Division, San Francisco, California conducted these analyses.

The sample collected from monitoring well MW-02 was analyzed for additional constituents. The specific gravity of the DNAPL portion of the sample was determined, and the associated aqueous phase sample was analyzed for total organic carbon (TOC). In addition to analyzing the DNAPL for VOCs using GC/MS (EPA Method 8240), this sample was also analyzed for halogenated volatile organics using GC (EPA Method 8010). This GC analysis was performed to attain a lower detection limit than was achievable with the GC/MS method. Inorganic analyses were not conducted on the DNAPL sample. With the exception of TOC analysis, Kennedy/Jenks/Chilton Laboratory Division, San Francisco, California performed the analyses of the MW-02 samples. TOC was analyzed by ACCULAB Environmental Services, Petaluma, California.

6.3 Results

This section presents groundwater sample analytical findings and a summary of groundwater hydraulic conditions observed during sampling.

6.3.1 Groundwater Hydraulic Conditions

Groundwater levels measured in the monitoring wells that were sampled were approximately 20 feet below mean sea level (MSL), or about 60 to 70 feet below ground surface. Estimated groundwater elevation contours are shown on Figure 6-2. The groundwater flow direction was southeastward and the hydraulic gradient was less than one foot per 1,000 feet.

6.3.2 Organic Chemical Occurrence

Concentrations of volatile organic compounds (VOCs) and p-CBSA detected in the groundwater samples are summarized in Table 6-2. Laboratory reports for VOCs and p-CBSA are contained in Appendix C and D, respectively. QA/QC results are presented in Appendix G.

Chloroform and chlorobenzene concentrations generally varied proportionally in the groundwater samples, i.e., chloroform concentrations were high in samples where chlorobenzene concentrations were high. Chloroform concentrations were appreciable (i.e., greater than 20,000 $\mu\text{g/L}$) in samples from monitoring wells MW-01, MW-05, and MW-09 (see Figure 6-3). Chloroform was also detected in samples from monitoring wells MW-02 (both in aqueous and DNAPL fractions), MW-03, MW-04, MW-06, MW-07, MW-13, and MW-19. The occurrence of chloroform in groundwater at the location of monitoring well MW-02 is discussed in detail in Section 5.3.1 and below in Section 6.4. Chlorobenzene concentrations were greater than 40,000 $\mu\text{g/L}$ in samples from MW-01, MW-02, MW-05, and MW-09 (see Figure 6-4). Chlorobenzene was also detected in monitoring wells MW-06, MW-10, MW-11, and MW-13.

p-CBSA was detected in samples from the following monitoring wells: MW-01, MW-02, MW-04, MW-05, MW-06, MW-07, MW-09, MW-13, and MW-14 (see Figure 6-5). Detected concentrations of p-CBSA ranged from 470 milligrams per liter (mg/L) in the aqueous phase sample from MW-02 to 1.9 mg/L in the sample from MW-14. p-CBSA concentrations exceeded 10 mg/L in samples collected from MW-01, MW-02, MW-06, and MW-09. The presence of p-CBSA was confirmed by GC/MS analysis in five samples (see Appendix-D).

Reported benzene concentrations were high (i.e., greater than 5,000 $\mu\text{g/L}$) in samples collected from monitoring wells MW-01, MW-07, MW-13, and MW-14. The sample collected from MW-13 contained detectable concentrations of toluene, ethylbenzene, and total xylenes, and MW-14 contained detectable concentrations of ethylbenzene and total xylenes. Samples collected from the other eleven wells contained benzene, toluene, ethylbenzene, and total xylenes concentrations less than the analytical limit of detection.

PCE and TCE were detected in several of the samples (see Table 6-2). The highest reported PCE concentration was 5,700 $\mu\text{g/L}$ in the sample from monitoring well MW-01, and the highest TCE concentration was reported at 820 $\mu\text{g/L}$ in the MW-18 sample. Samples collected from monitoring wells MW-01,

MW-06, MW-07, MW-14, and MW-18 contained detectable concentrations of one or more of the following chemicals: methylene chloride, carbon tetrachloride, acetonitrile, acetone, 4-methyl-2-pentanone, 1,2-dichloroethane, and 1,1-dichloroethylene (see Table 6-2).

6.3.3 Inorganic Chemical Occurrence

Concentrations of inorganic species detected in the groundwater samples are summarized in Table 6-3. Laboratory reports for inorganic chemicals and other measured parameters are contained in Appendix E, except for the results for the sample collected from monitoring well MW-02 which are presented in Appendix F. QA/QC results are presented in Appendix G.

The range of concentrations of most inorganic species among monitoring wells was considerable. Total dissolved solids (TDS) concentrations ranged from 15,000 mg/L in the aqueous phase sample from monitoring well MW-02 to 400 mg/L in the MW-18 sample (see Figure 6-6). Sulfate concentrations are also widely distributed among monitoring wells (see Figure 6-7). Appreciable concentration differences among monitoring wells were also reported for chloride, bicarbonate, nitrate, calcium, magnesium, and sodium. The pH of the water samples ranged from 6.4 in the aqueous phase sample from MW-02 to 7.1 in the sample from MW-09.

6.3.4 Montrose Source Area Analytical Findings

Analytical results for the DNAPL and associated aqueous phase samples collected from monitoring well MW-02 are summarized in Table 6-4. The sample collected from monitoring well MW-02 consisted of two phases: (1) a dense, non-aqueous phase (i.e., DNAPL) and (2) an associated aqueous phase. The two phases were analyzed separately. Laboratory reports for analyses conducted on the sample from MW-02 are contained in Appendix F, except for the p-CBSA reports which are presented in Appendix D. QA/QC results are presented in Appendix G.

The DNAPL collected from monitoring well MW-02 was visually observed in the field to be a viscous, dark brown, dense liquid. The laboratory-measured specific gravity of this DNAPL is 1.22 grams per cubic centimeter (cm³). The only volatile organic compounds detected in the DNAPL sample were chlorobenzene and chloroform, which were reported at 670,000 and 800,000 µg/L (i.e., 67 and 0.08 percent), respectively. p-CBSA was detected in the DNAPL at 29 µg/L.

The aqueous phase liquid above the DNAPL collected from monitoring well MW-02 was light yellow and clear. The TOC of this aqueous fraction was reported at 1,320 mg/L. The chlorobenzene and chloroform concentrations were 250,000 and 5,300 µg/L, respectively. The concentration of p-CBSA in this aqueous sample was 470 mg/L. The aqueous fraction sample from MW-02 had considerably higher concentrations of inorganic chemicals than the samples collected from monitoring wells at locations presumably unaffected by chemical releases from the Montrose Site.

TABLES

Table 2-1

SUMMARY OF REGULATORY-LISTED SITES WITHIN VICINITY OF DAC C6 FACILITY

INFORMATION SOURCES	I.D (see figure 2-1)	SITE NAME AND COMMENTS
LUST LACDPW RWQCB-LA	1	Trico Industries - 19706 Normandie, Los Angeles. Former oil pump maintenance company Leak from unlined cesspool Soil Contamination: Diesel fuel, Trichloroethylene, Tetrachloroethylene Lateral migration minimal
LUST LACDPW	2	AKZO Coatings of America - 20846 Normandie, Torrance Former aircraft paint manufacturer Soil and Shallow Groundwater Contamination: Toluene, Acetone, MEK, MIBK, Xylene
LUST	3	Unocal #5131 - 18605 Western, Torrance Under investigation for underground waste oil tank leak
LUST	4	Carson Estates Company - 20225 S. Western, Torrance Listed as underground fuel tank leak site Soil and Shallow groundwater contaminated with gasoline
NPL BOND CaDHS	5	Del Amo Blvd. Site - Between Normandie and Vermont Formerly operated condensing ponds for polystyrene manufacturers. Federal Superfund site. Remedial Investigation ongoing 9 unlined evaporation ponds Underlying soils contaminated with polynuclear aromatic compounds.
NPL Bond	6	Montrose Chemical Company Site - 20201 S. Normandie, Torrance Former DDT manufacturing facility. Federal Superfund site. Remedial Investigation ongoing Soil and Groundwater contamination: Monochlorobenzene, Chloroform, DDT, other chlorinated organic compounds.
ASPIS Bond LACSD	7	Amoco Chemicals Corporation - 1225 W. 196th, Torrance Former Polystyrene manufacturing facility. Small amounts of oil and phenols in industrial wastewater. Operated dry well for industrial wastewater disposal.
ASPIS CaDHS	8	Lawson Enterprises, Inc. - 19500 S. Normandie, Torrance Operated 14 underground tanks containing: recycled solvents, isopropanol, naphtha, toluene, gasoline. Abandoned site - no further action called for

Table 2-1 (cont.)

SUMMARY OF REGULATORY-LISTED SITES WITHIN VICINITY OF DAC C6 FACILITY

INFORMATION SOURCES	I.D (see figure 2-1)	SITE NAME AND COMMENTS
LUST RWQCB-LA	9	Unocal #6075 - 1875 190th, Torrance Under investigation for underground gasoline tank leak Soil contamination with oil and grease. Lateral migration minimal.
LUST RWQCB-LA LACSD	10	Douglas Aircraft Corporation, C6 Facility - 19503 Normandie, Torrance Aircraft fabrication facility. Leaking underground storage tanks. Constituents reported in soil and shallow groundwater include gasoline components, 1,1,1-trichloroethane, trichloroethylene, methyl ethyl ketone, and methyl isobutyl ketone.
LACFD LACSD	11	Jones Chemical Company - 1401 W. Del Amo, Los Angeles Chemical transfer facility. Chemical inventory includes: Muriatic, sulfuric, nitric, phosphoric, hydrofluoric, and chromic acids; caustic soda and potash; sodium and calcium hypochlorite; sodium hydrosulfite; sodium nitrate; sodium cyanide; chlorine; anhydrous ammonia; sulphur dioxide; cyanurate; isopropanol; methanol; acetone; MEK; toluene; xylene; pine oil; and formaldehyde. Received permit in 1981 for dry well discharge of neutralized industrial wastewater.
ASPIS CaDHS	12	Sully - Miller Contracting Co. - 20860 S. Normandie, Los Angeles Asphalt product manufacturer. Soil contaminated with diesel. Low priority preliminary investigation called for by CaDHS.
ASPIS	13	Kenitex Chemicals, Inc. - 1234 Francisco, Torrance Initial investigation by CaDHS, no further action called for.
ASPIS	14	Menardi & Company - 1201 W. Francisco, Torrance Initial investigation by CaDHS, no further action called for.
ASPIS	15	Permabilt Industries - 19306 S. Normandie, Los Angeles Initial investigation by CaDHS, no further action called for.
ASPIS CaDHS	16	Quantrac Corporation - 19900 S. Normandie, Los Angeles Medium - level generator of hazardous waste. Low priority preliminary assessment called for by CaDHS.

Table 2-1 (cont.)

SUMMARY OF REGULATORY-LISTED SITES WITHIN VICINITY OF DAC C6 FACILITY

INFORMATION SOURCES	I.D (see figure 2-1)	SITE NAME AND COMMENTS
ASPIS	17	Tylan corporation – 19220 South Normandie, Torrance Initial investigation by CaDHS, no further action called for.
ASPIS	18	Warren Southern, Inc. – 20934 S. Normandie, Los Angeles Initial investigation by CaDHS, no further action called for.
LACFD	19	Capitol Metals – 20000 Western, Torrance Acid processing of ferrous metals. Chemical inventory includes: mineral spirits, AW315 hydraulic oil, gear oils, acetylene, ferrous chloride.
LACFD	20	Industrial Light Metals – 19200 S. Western, Torrance Aluminum product manufacturer. 19 underground storage tanks containing: lubricant oil, fuel oil, and naptha. 3 tanks with leaking underground piping. Lateral migration minimal. Contaminated soil removed in 1986

ASPIS – Abandoned Site Program Information System list (CaDHS)

Bond – California State Superfund Bond Expenditure list

LUST – Leaking Underground Storage Tank list (RWQCB-LA)

NPL – National Priority List (United States Environmental Protection Agency)

CaDHS – California Department of Health Services

RWQCB-LA – California Regional Water Quality Control Board

Los Angeles Region

LACDPW – Los Angeles County Department of Public Works,

Waste Management Division

LACFD – Los Angeles County Fire Department,

Fire Prevention Division

LACSD – Los Angeles County Sanitation District

TABLE 5-1

COMPILATION OF PREVIOUS GROUNDWATER SAMPLE ANALYTICAL RESULTS
CHLOROFORM AND CHLOROBENZENE CONCENTRATIONS

Monitoring Well	Date Sampled	Chloroform (µg/L)	Chlorobenzene (µg/L)	Monitoring Well	Date Sampled	Chloroform (µg/L)	Chlorobenzene (µg/L)
MW-01	19-May-89	8,200	28,000	MW-12	16-May-89	8,200	5,700
MW-01	17-Nov-89	9,400	28,000	MW-12	25-Oct-89	ND(500)	6,000
MW-01	20-Apr-90	11,000	38,000	MW-12	24-Feb-90	5,700	5,700
MW-01	01-Feb-91	26,000	61,000	MW-12	18-Apr-90	5,000	8,200
MW-03	19-May-89	700	ND(10)	MW-13	17-May-89	1,000	2,400
MW-03	28-Oct-89	410	ND(50)	MW-13	25-Oct-89	1,200	3,200
MW-03	20-Apr-90	670	6	MW-13	24-Feb-90	1,000	2,700
MW-03	31-Jan-91	630	ND(10)	MW-13	21-Apr-90	900	2,600
				MW-13	30-Jan-91	1,500	3,100
MW-04	18-May-89	ND(10)	360	MW-14	16-May-89	ND(25)	180
MW-04	16-Nov-89	ND(50)	360	MW-14	24-Oct-89	ND(50)	400
MW-04	20-Apr-90	10	500	MW-14	24-Feb-90	ND(100)	900
MW-04	01-Feb-91	26	ND(5)	MW-14	17-Apr-91	ND(100)	400
				MW-14	31-Jan-91	ND(125)	ND(125)
MW-05	19-May-89	22,000	47,000	MW-15	17-May-89	ND(200)	26,000
MW-05	28-Oct-89	20,000	37,000	MW-15	24-Oct-89	ND(1,000)	32,000
MW-05	21-Apr-90	18,000	34,000	MW-15	23-Feb-90	ND(1,000)	22,000
MW-05	01-Feb-91	25,000	43,000	MW-15	18-Apr-90	ND(250)	22,000
MW-06	16-May-89	4,700	5,500	MW-16	05-Apr-90	52	ND(5)
MW-06	27-Oct-89	4,400	6,400	MW-16	16-Apr-90	110	ND(5)
MW-06	24-Feb-90	8,300	13,000				
MW-06	20-Apr-90	4,700	7,000	MW-17	05-Apr-90	2	2
MW-06	31-Jan-91	4,700	6,500	MW-17	16-Apr-90	8	2
MW-07	16-May-89	810	ND(200)	MW-18	05-Apr-90	100	ND(20)
MW-07	28-Oct-89	890	ND(500)	MW-18	20-Apr-90	110	ND(10)
MW-07	24-Feb-90	840	630	MW-18	30-Jan-91	220	ND(5)
MW-07	20-Apr-90	800	ND(200)				
MW-07	31-Jan-91	1,300	ND(250)	MW-19	05-Apr-90	67	ND(1)
				MW-19	20-Apr-90	56	ND(1)
MW-08	12-May-89	ND(1)	5	MW-19	30-Jan-91	82	ND(5)
MW-08	15-May-89	ND(1)	ND(1)				
MW-08	27-Oct-89	ND(1)	ND(1)	MW-20	06-Apr-90	ND(10,000)	ND(10,000)
MW-08	22-Feb-90	ND(1)	ND(1)				
MW-08	20-Apr-90	ND(1)	ND(1)	MW-21	05-Apr-90	ND(2,000)	ND(2,000)
MW-08	30-Jan-91	ND(5)	ND(5)				
MW-09	12-May-89	65,000	150,000	MW-22	05-Apr-90	48	ND(1)
MW-09	17-May-89	70,000	150,000	MW-22	19-Apr-90	45	ND(1)
MW-09	27-Oct-89	85,000	180,000				
MW-09	22-Feb-90	28,000	150,000	MW-23	25-Feb-90	ND(1)	ND(1)
MW-09	20-Apr-90	74,000	180,000	MW-23	18-Apr-90	ND(1)	ND(1)
MW-09	01-Feb-91	36,000	77,000				
MW-10	18-May-89	33	1,300	MW-24	26-Oct-89	4	ND(1)
MW-10	27-Oct-89	ND(100)	790	MW-24	25-Feb-90	2	ND(1)
MW-10	22-Feb-90	ND(20)	870	MW-24	17-Apr-90	ND(1)	ND(1)
MW-10	20-Apr-90	10	820				
MW-10	30-Jan-91	ND(25)	680	MW-25	28-Oct-89	510	990
				MW-25	22-Feb-90	400	920
				MW-25	17-Apr-90	390	990
MW-11	25-Feb-90	1,200	22,000	MW-26	28-Oct-89	ND(1)	4
MW-11	27-Oct-89	2,800	34,000	MW-26	24-Feb-90	ND(1)	9
MW-11	18-May-89	4,100	29,000	MW-26	17-Apr-90	ND(1)	6
MW-11	18-Apr-90	700	20,000				
MW-11	31-Jan-91	ND(125)	5,500				

ND (10): Not detected at the concentration limit shown in parentheses.

TABLE 5-2

CONCENTRATIONS OF MAJOR INORGANIC SPECIES
MONITORING WELLS MW-08 AND MW-09, MAY 1989

PARAMETER (Units)	CONCENTRATION	
	MW-08	MW-09
pH (standard pH units)	7.7	6.8
Total Dissolved Solids (mg/L)	780	2,500
Silica (mg/L as SiO ₂)	19	40
Bicarbonate Alkalinity (mg/L as CaCO ₃)	180	570
Chloride (mg/L)	320	672
Sulfate (mg/L)	40	480
Calcium (mg/L)	97	420
Magnesium (mg/L)	27	100
Potassium (mg/L)	7.7	19
Sodium (mg/L)	97	170

mg/L: milligrams per liter.

Note: Data obtained from: Hargis + Associates, Inc., June 30, 1989. Raw Analytical Data, Part 2, Remedial Investigative Work, Phase 2A, Montrose Site, Torrance, California, Volume Five, May 1989, Groundwater Sampling.

TABLE 5-3

UPPER BELLFLOWER AQUITARD MONITORING WELLS
SCREEN INTERVAL CONSTRUCTION DATA

MONITORING WELL	DATE DRILLED	SCREEN INTERVAL (ft. bgs)	[REFERENCE]	Water Level ⁽¹⁾ (Ft. Below Reference Point)	Approximate Wetted Screen Length ⁽²⁾ (Feet)
MW-1	4/26/85	63.0 - 73.0	[Metcalf & Eddy (1986)]	64.61	8.39
MW-2	4/27-85	66.7 - 76.7	[Metcalf & Eddy (1986)]	69.98	6.72
MW-3	4/26/85	64.4 - 74.4	[Metcalf & Eddy (1986)]	67.93	6.47
MW-4	4/26/85	64.9 - 74.9	[Metcalf & Eddy (1986)]	67.53	7.37
MW-5	4/25/85	61.5 - 72.5	[Metcalf & Eddy (1986)]	66.01	6.49
MW-6	11/17/89	65 - 80	[H+A (March 9, 1989)]	66.87	13.13
MW-7	11/18/89	65 - 80	[H+A (March 9, 1989)]	67.77 ⁽³⁾	12.23
MW-8	5/10/89	65 - 80	[H+A (June 9, 1989)]	69.54	10.46
MW-9	5/9/89	66 - 81	[H+A (June 9, 1989)]	69.46	11.54
MW-10	11/22/89	62 - 77	[H+A (March 9, 1989)]	63.99	13.01
MW-11	11/23/89	62 - 77	[H+A (March 9, 1989)]	64.06	12.94
MW-12	11/19/89	61 - 76	[H+A (March 9, 1989)]	61.68	14.32
MW-13	11/15/89	62 - 77	[H+A (March 9, 1989)]	64.17	12.83
MW-14	11/21/89	58 - 73	[H+A (March 9, 1989)]	65.09	7.91
MW-15	11/21/89	62 - 77	[H+A (March 9, 1989)]	62.44	14.56
MW-16	3/31/90	59 - 76	[H+A (April 27, 1990)]	62.91	13.09
MW-17	4/2/90	65 - 81	[H+A (April 27, 1990)]	68.73	12.27
MW-18	3/29/90	68 - 83	[H+A (April 27, 1990)]	70.58	12.42
MW-19	3/30/90	63 - 79	[H+A (April 27, 1990)]	66.77	12.23
MW-20	4/4/90	57 - 73	[H+A (April 27, 1990)]	63.44 ⁽³⁾	9.56
MW-21	3/28/90	54 - 70	[H+A (April 27, 1990)]	57.83	12.17
MW-22	4/1/90	57 - 73	[H+A (April 27, 1990)]	63.72	9.28
MW-23	8/3/89	60 - 75	[H+A (April 27, 1990)]	59.22	15.78
MW-24	8/4/89	49 - 64	[H+A (April 27, 1990)]	44.57	19.43
MW-25	8/5/89	56 - 71	[H+A (April 27, 1990)]	55.31	15.69
MW-26	8/6/89	59 - 74	[H+A (April 27, 1990)]	61.35	12.65

bgs: below ground surface

(1) Water level measurements taken on 4.16/90 (Hargis & Associates, Inc. October 31, 1990).

(2) Wetted screen lengths o 4/16/90. Lengths are approximate because of sight discrepancy between reference point elevation and ground surface elevation.

(3) Depth to the top of floating product.

TABLE 6-1
GROUNDWATER SAMPLING INFORMATION

WELL NO.	SAMPLE DATE	SAMPLE TIME	REF. POINT ELEVATION (ft. abv. MSL) (1)	WATER LEVEL (ft. Below Ref Point)	WATER LEVEL ELEVATION (ft.abv MSL)	VOLUME PURGED (gal)	FINAL TEMP (deg. C)	FINAL pH	FINAL EC (umhos/cm @ 25 deg.C) (2)	COMMENTS:
MW-01	2/1/91	1300	42.83	63.80	-20.97	19.0	24.3	6.89	8,600	Sl. solv. od ; clr; foaming agent.
MW-02	2/1/91	1345	NA	NM	NA	0	NM	NM	NM	Grab sample w/o purging.
MW-03	1/31/91	1710	47.41	67.50	-20.09	13.0	20.2	6.82	1,220	Sl. solv. odor; clr.
MW-04	2/1/91	1015	46.69	66.96	-20.27	17.0	19.2	6.75	2,410	Mod. solv. odor; clr
MW-05	2/1/91	1150	44.95	65.36	-20.41	14.0	23.6	6.78	3,090	Strong solv. odor; clr.
MW-06	1/31/91	1346	45.68	66.30	-20.62	27.0	23.2	6.3	7,470	Sl. solv. odor; clr; foaming agent
MW-07	1/31/91	1520	47.42	68.14	-20.72	23.0	21.6	6.71	3,590	Sl. solv. odor; clr; foaming agent
MW-08	1/30/91	1320	49.09	68.92	-19.83	21.0	23.0	7.18	1,040	Clear
MW-09	2/1/91	1600	48.67	67.78	-19.11	23.0	22.4	6.73	2,320	Mod. solv. odor; lt. yellow-clr.
MW-10	1/30/91	1505	43.20	63.36	-20.16	27.0	21.4	6.84	2,370	Clear
MW-11	1/31/91	1110	42.69	63.40	-20.71	27.0	21.4	6.74	2,590	Strong solv. odor; clr; foaming agent
MW-13	1/30/91	1705	42.34	63.56	-21.22	24.0	21.1	6.61	2,710	Sl. slov. odor; lt brn-clr; foaming agent
MW-14	1/31/91	0945	43.13	64.46	-21.33	18.0	21.5	6.54	2,090	Sl. solv. odor; clr; foaming agent
MW-18	1/30/91	1000	50.29	70.30	-20.01	21.0	22.4	7.11	640	Clear
MW-19	1/30/91	1120	46.55	66.48	-19.93	22.0	22.7	7.10	2,110	Clear-light yellow
NM : Not Measured NA : Not Applicable MSL: Mean Sea Level EC : Electrical Conductivity umhos/cm: micro mhos per centimeter (1) Reference point elevations measured by Hargis & Associates, Inc. (2) EC measurments corrected to 25 degrees C (USDA, 1954)										

TABLE 6-2

SUMMARY OF ANALYTICAL RESULTS (JAN/FEB 1991)
ORGANIC CHEMICALS

SAMPLE I.D.	CHLOROFORM (µg/L)	CHLOROBENZENE (µg/L)	p-CBSA (mg/L)	PCE (µg/L)	TCE (µg/L)	BENZENE (µg/L)	OTHER COMPOUNDS (µg/L)
MW-01-K1	26,000	61,000	14	5,700	ND(250)	12,000	Methylene Chloride: 370
MW-02-K1 AQ*	5,300	250,000	470	ND(5,000)	ND(5,000)	ND(5,000)	
MW-03-K1	630	ND(10)	ND(0.5)	ND(5,000)	ND(5,000)	ND(5,000)	
MW-04-K1	26	ND(5)	9.3	300	ND(5)	ND(5)	
MW-05-K1	25,000	43,000	6.1	ND(1,000)	ND(1,000)	ND(1,000)	
MW-06-K1	4,700	6,500	13	1,600	240	ND(125)	CCl ₄ : 450; Acetonitrile: 3,100; Acetone: 540; 4-methyl-2-pentone: 360
MW-07-K1	1,300	ND(250)	3.7	ND(250)	ND(250)	29,000	Acetone: 16; 4-methyl-2-pentone: 21
MW-08-K1	ND(5)	ND(5)	ND(0.5)	ND(5)	ND(5)	ND(5)	
MW-09-K1	36,000	77,000	32	ND(2,500)	ND(2,500)	ND(2,500)	
MW-10-K1	ND(5)	680	ND(0.5)	ND(25)	ND(25)	ND(25)	
MW-11-K1	ND(125)	5,500	ND(0.5)	220	ND(125)	ND(125)	
MW-13-K1	1,500	3,100	4.8	ND(125)	540	22,000	Toluene: 13,000; Ethylbenzene: 2,000; Total xylenes: 8,500
MW-14-K1	ND(125)	ND(125)	1.9	ND(125)	ND(125)	7,600	1,2-DCA: 600; Ethylbenzene: 1,300; Total Xylenes: 650
MW-18-K1	220	ND(5)	ND(0.5)	ND(5)	820	ND(25)	1,1-DCE: 27
MW-19-K1	82	ND(5)	ND(0.5)	ND(5)	32	ND(5)	

* Aqueous Fraction

ND(250): Not detected at the concentration limit shown in parentheses.

µg/L: Micrograms per liter.

mg/L: Milligrams per liter.

p-CBSA: para-chlorobenzenesulfonic acid; PCE: tetrachloroethylene; TCE: trichloroethylene; CCl₄: Carbon tetrachloride; 1,2-DCA: 1,2-dichloroethane;
1,1-DCE: 1,1-dichloroethylene

TABLE 6-3

SUMMARY OF ANALYTICAL RESULTS (JAN/FEB 1991)
INORGANIC CHEMICALS AND PARAMETERS

SAMPLE I.D.	pH	EC (μ mhos/cm @ 25 C)	TOTAL DISS. SOLIDS (mg/L)	TOTAL ALK. (mg/L as CaCO ₃)	TOTAL HARDNESS (mg/L as CaCO ₃)	SULFATE (mg/L)	CHLORIDE (mg/L)	BICARB. ALK. (mg/L as HCO ₃)	NITRATE (mg/L as N)	CALCIUM (mg/L)	MAGNESIUM (mg/L)	POTASSIUM (mg/L)	SODIUM (mg/L)
MW-01-K1	6.9	6,500*	5,200	550	3,100	600	2,300	670	0.04	810	260	18	600
MW-02-K1-A**	6.4	11,000***	15,000	420	4,100	6,400	2,200	510	0.62	520	670	18	2,300
MW-03-K1	6.9	1,200	710	430	500	41	180	520	0.04	140	39	4.5	81
MW-04-K1	6.7	1,900	1,500	480	900	240	400	590	8.0	270	67	11	120
MW-05-K1	6.8	2,500	2,000	620	1,300	150	670	760	1.5	370	91	12	130
MW-06-K1	6.8	6,100*	5,800	520	3,900	1,900	1,800	630	16	1,000	290	22	390
MW-07-K1	6.8	2,800	2,500	430	1,700	460	780	520	0.21	450	150	6.4	190
MW-08-K1	6.9	920	590	200	330	26	220	240	1.9	86	27	8.0	90
MW-09-K1	7.1	2,300	1,700	460	1,200	310	420	560	0.54	330	82	13	120
MW-10-K1	6.8	2,000	1,500	330	930	75	570	400	11	270	61	12	140
MW-11-K1	6.9	2,000	1,700	750	1,100	270	370	920	0.04	290	94	12	160
MW-13-K1	6.8	2,300	1,800	450	1,100	180	620	550	0.13	274	100	7.4	210
MW-14-K1	6.9	1,900	1,300	760	810	31	350	930	0.07	190	77	6.4	390
MW-18-K1	6.7	640	400	200	200	36	66	250	1.6	58	14	5.7	56
MW-19-K1	6.8	1,000	800	170	400	29	280	200	2.9	120	23	9.4	82

* Indicates a re-run value

** Aqueous Fraction

*** The high organic content of this sample may have interfered with the specific conductance measurement.

mg/L: milligrams per liter

μ mhos/cm: micro mhos per centimeter

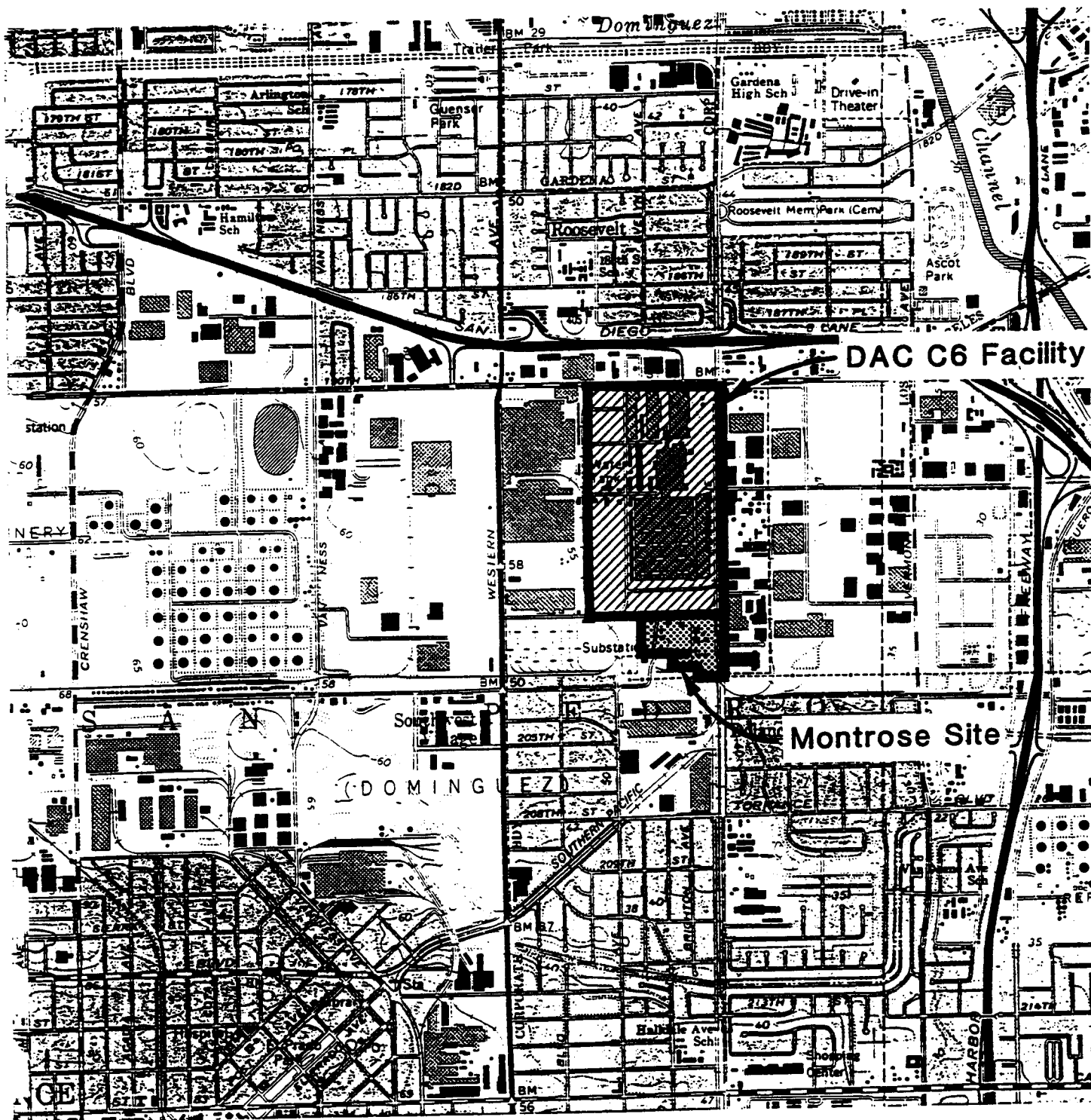
EC: Electrical Conductivity (specific conductance)

TABLE 6-4

SUMMARY OF ANALYTICAL RESULTS (JAN/FEB 1991)
DNAPL AND ASSOCIATED AQUEOUS FRACTION
WELL NO. MW-02

Constituent (Units)	Dense, Non-Aqueous Phase Liquid (DNAPL)	Associated Aqueous Phase Liquid*
<u>PHYSICAL PROPERTIES</u>		
Physical Appearance	Dark Brown, Dense	Light Yellow, Clear
Specific Gravity (g/cm ³)	1.22	NM
<u>ORGANIC CONSTITUENTS</u>		
Total Organic Carbon (mg/L)	NM	1,320
Chlorobenzene (µg/L)	670,000,000	250,000
Chloroform (µg/L)	800,000**	5,300
p-CBSA (mg/L)	29	470
<u>INORGANIC CONSTITUENTS</u>		
pH (standard pH Units)	NM	6.4
Total Dissolved Solids (mg/L)	NM	15,000
Specific Conductance (µmhos/cm)	NM	11,000***
Total Alkalinity (mg/L as CaCO ₃)	NM	420
Total Hardness (mg/L as CaCO ₃)	NM	4,100
Sulfate (mg/L)	NM	6,400
Chloride (mg/L)	NM	2,200
Bicarbonate (mg/L)	NM	510
Nitrate (mg/L)	NM	0.62
Calcium (mg/L)	NM	520
Magnesium (mg/L)	NM	670
Potassium (mg/L)	NM	18
Sodium (mg/L)	NM	2,300
<p>NM: Not Measured g/cm³: grams per cubic centimeter mg/L: milligrams per liter µg/L: micrograms per liter µmhos/cm: micro mhos per centimeter</p> <p>*This sample was collected without purging the well. Concentrations reported for the aqueous phase sample may not be representative of the water in the surrounding formation.</p> <p>**This concentration represents the average of two gas chromatographic analyses for Halogenated Volatile Organics (EPA Method 8010).</p> <p>***The high organic content of this sample may have interfered with the specific conductance measurement.</p>		

FIGURES



DAC C6 Facility

Montrose Site



0 1,000 2,000 FEET

Base Map: U.S.G.S. 7.5 Minute Topographic Map,
Torrance, California Quadrangle, 1981.

Kennedy/Jenks/Chilton

McDonnell Douglas Corporation
DAC C6 Facility

Site Vicinity Map

June 1991
K/J/C 904020.00

Figure 1-1

6.4 Interpretation of Findings

The distribution of chloroform, chlorobenzene, p-CBSA, and sulfate concentrations in the Upper Bellflower Aquitard indicates that occurrence of these chemicals in groundwater beneath the DAC C6 property is related to chemical releases at the Montrose property.

The groundwater flow direction was observed to be southeastward and the gradient was essentially flat, at less than one foot per 1,000 feet. Because of the flat gradient and the low hydraulic conductivities of the fine-grained sediments of the Upper Bellflower Aquitard, groundwater velocities are probably very slow. Chemical transport in this saturated zone is probably more governed by diffusion than by hydraulic advection. Thus, although the prevailing groundwater flow direction is southeastward, chemical transport by molecular diffusion could account for northward chemical migration. Also, as discussed in Sections 4.0 and 5.0, horizontal chemical migration in the unsaturated zone could account for the occurrence of DDT-related chemicals in groundwater beneath the DAC C6 property.

The occurrence of chloroform in the groundwater samples appears related to the occurrence of "DDT indicator" compounds. The distribution of chlorobenzene, a major raw material used by Montrose, was correlated to the distribution of chloroform. Concentrations of chloroform were consistently high in samples with high concentrations of chlorobenzene. This correlation between chloroform and chlorobenzene implies that the same process or processes accounted for the distribution of these two compounds in the Upper Bellflower Aquitard. Also, the ratio of chlorobenzene to chloroform concentrations (on a mg/L basis) was generally consistent among monitoring wells, at approximately 2:1. This ratio is equivalent to the stoichiometric ratio used by Montrose in mixing chlorobenzene with chloral to make DDT. As discussed in Section 5.0, chloral transforms to chloroform through hydrolysis (one mole of chloral yields one mole of chloroform), so the observed 2:1 ratio between chlorobenzene and chloroform concentrations is consistent with a scenario where chloral was released with chlorobenzene and subsequently transformed to chloroform.

In addition to chlorobenzene, another DDT indicator compound is p-CBSA, which is unique to the DDT manufacturing process and formed when chlorobenzene is mixed with fuming sulfuric acid. The presence of p-CBSA in the sample from monitoring well MW-09 indicates that chemical releases attributable to DDT manufacturing have affected the groundwater at the location of MW-09. The distribution of p-CBSA was also similar to the distributions of chlorobenzene and chloroform, i.e., p-CBSA concentrations were generally high in samples with appreciable chlorobenzene and chloroform concentrations.

Groundwater samples containing appreciable concentrations of chloroform, chlorobenzene, and p-CBSA also contained elevated concentrations of sulfate. The increased sulfate may be attributable to a release of sulfuric acid, which was used in large quantities by Montrose. Montrose also generated large quantities of sulfuric acid waste. Sulfuric acid is highly polar and readily dissociates in water to form sulfate. Considering the nature of the operations at Montrose, sulfuric acid releases probably occurred simultaneously with organic chemical releases at or near the same locations.

The presence of chloroform in the DNAPL sample collected from monitoring well MW-02 indicates that the DNAPL which underlies the Montrose Site is a source of dissolved chloroform to the shallow groundwater. Release of this DNAPL was undisputably related to activities at the Montrose property. Monitoring well MW-02 is located at the approximate location of the former wastewater settling pond on the Montrose property, and nearly 70 percent of the DNAPL is comprised of chlorobenzene. Hargis + Associates has reported that DDT is present in the DNAPL collected from monitoring well MW-02 (Hargis + Associates, Inc., October 31, 1990). Considering the magnitude of chloroform concentrations in samples from offsite wells and in onsite wells located away from the central process area, chloroform was probably released to the subsurface in aqueous solution as well as in DNAPL. Lateral migration of DNAPL in the Upper Bellflower Aquitard would be anticipated to be limited because of its immiscibility in water and density, as well as the slow groundwater velocities. Because the spatial distribution of chlorobenzene is closely related to that of chloroform in the Upper Bellflower Aquitard, much of the chlorobenzene released to the subsurface was probably also in aqueous solution. Possible scenarios for introduction of chemicals of concern to the shallow groundwater are discussed further in Section 5.0.

7.0 CONCLUSIONS AND RECOMMENDATIONS

The technical review and field sampling work described in this report focused on obtaining and analyzing available information in order to evaluate specific potential sources and/or chemical transformation mechanisms that could account for the presence of chloroform in shallow groundwater in the vicinity of the DAC C6 property. The investigation specifically focused on providing answers to two related questions: (1) can it be demonstrated that chloroform was used or otherwise present in the DDT manufacturing process formerly conducted at the Montrose Site, and (2) are there site-specific hydrogeologic/chemical mechanisms which could explain the occurrence of chloroform in shallow groundwater beneath the DAC C6 property.

Review of technical documents and groundwater sampling and analysis results indicate that chloroform and chlorobenzene detected in groundwater samples from monitoring well MW-09 are probably present as a result of chemical releases at the Montrose Site. This conclusion is supported by the following findings:

SOURCES OF CHLOROFORM

- Chloral, a major raw material used by Montrose Chemical, transforms to chloroform, as shown in the reaction below.

CHLORAL HYDROLYSIS:



This reaction occurs most rapidly under alkaline conditions (i.e., pH greater than 7.0), but given the duration of chemical release at the Montrose Site, appreciable chloral hydrolysis could have occurred under neutral or near-neutral pH conditions. Montrose routinely neutralized their wastewater and/or produced large quantities of alkaline waste from the DDT manufacturing process, thus creating an environment for chloral transformation to chloroform. Furthermore, chloroform was reportedly a 0.1 to 0.2 percent impurity in the chloral used by Montrose. Considering the large quantities of chloral used by Montrose throughout their operational years (1947 to 1982), this impurity could have accounted for substantial amounts of chloroform handled and discharged to the subsurface on the Montrose Site.

- Chloroform was detected in a sample of dense, non-aqueous phase liquid (DNAPL) collected from monitoring well MW-2, which is located on the Montrose property at the approximate location of the former wastewater settling pond. The majority (about 67 percent) of the DNAPL's composed of chlorobenzene and Hargis + Associates reported an appreciable amount of DDT in DNAPL collected from MW-02. It is not disputed that this DNAPL was released to the subsurface by Montrose Chemical. The presence of appreciable concentrations of chloroform in the DNAPL (i.e., 800,000 µg/L) strongly suggests that the DNAPL released on the Montrose property is a source for dissolved chloroform in shallow groundwater.

SPATIAL OCCURRENCE OF DDT INDICATOR COMPOUNDS

- Para-chlorobenzenesulfonic acid (p-CBSA) was detected in a groundwater sample collected from monitoring well MW-09. p-CBSA is a synthesis by-product of DDT manufacture and is unique to DDT production. Occurrence of this chemical in the sample from monitoring well MW-09 is a clear indication that chemicals associated with DDT manufacture migrated to the location of this well.
- The chloroform and chlorobenzene concentration data were correlated in terms of the following: (1) chloroform and chlorobenzene generally occurred concurrently, (2) samples with appreciable concentrations of chloroform consistently had appreciable chlorobenzene concentrations, and (3) the ratio of chlorobenzene to chloroform concentrations (approximately 2:1) was consistent among most samples. The ratio of chlorobenzene concentrations to chloroform concentrations (i.e., approximately 2:1) detected in groundwater is roughly the same as the ratio of chlorobenzene to chloral formerly used by Montrose Chemical. These correlations imply that the occurrence of chloroform and that of chlorobenzene are associated with the same process, or source. The groundwater chemical analysis data suggest that the Montrose Site is the source for both chlorobenzene and chloroform to the shallow groundwater in the site vicinity.
- Sulfate concentrations in groundwater samples collected from wells completed in the Upper Bellflower Aquitard appear to be correlatable to the presence of chlorobenzene, chloroform, and p-CBSA. The increased concentrations of sulfate in samples from MW-09 and other wells with appreciable concentrations of chloroform, chlorobenzene, and p-CBSA further supports the premise that chemicals associated with DDT manufacture were transported northward in the subsurface environment in the vicinity of the DAC C6 property. Montrose used considerable quantities of sulfuric acid (which readily dissociates to sulfate), and p-CBSA can potentially desulfonate to yield sulfate and chlorobenzene.

CHEMICAL TRANSPORT MECHANISMS

It is clear from the above findings that chemicals associated with DDT manufacture have migrated to the location of monitoring well MW-09. Consideration of site-specific factors governing subsurface transport in the vicinity of the Montrose Site provides a chemical/transport conceptual model that accounts for the presence of chlorobenzene and chloroform in groundwater that technically occurs hydraulically upgradient (i.e., at the location of monitoring well MW-09) from the probable surface release locations for these chemicals. In this model, chlorobenzene and chloroform (and/or parent compounds of chloroform, e.g., chloral) discharge to surficial soils on the Montrose Site and migrate northward through either (1) spreading and structurally governed flow in the unsaturated zone, (2) migration in the uppermost saturated zone due to diffusion and/or localized perturbations in the piezometric surface resulting in north-flowing groundwater conditions, or (3) a combination of these phenomena.

Possible sources for introduction of significant masses of chlorobenzene and chloroform into the subsurface environment at the Montrose Site appear to be: (1) the former railroad tank car off-loading areas in the northeastern and southeastern portions of the Montrose property, and (2) the wastewater settling pond formerly located in the north-central portion of the Montrose property. Chemical releases probably occurred at both these locations in varying degrees, and possibly at other locations on the Montrose property, particularly in the north-central portion of the property where the DDT process vessels and equipment were located and the majority of chemicals and wastes were stored.

Physical site characteristics, historic practices/operations, and investigation information that support the conceptual model described above include:

- The upper approximately 25 to 30 feet of unsaturated zone sediments in the vicinity of the Montrose Site are predominantly comprised of interbedded silts and clays (fine-grained sediments). The lower portion of the 60- to 70-foot thick unsaturated zone is comprised of fine sand or silty sand. Based upon typically observed soil/water interactions and generally-accepted hydrogeologic principles, one would expect water (or aqueous solutions of organic chemicals) infiltrating near ground surface under constant head conditions (e.g., settling pond conditions) and percolating through fine-grained unsaturated zone sediments to exhibit appreciable lateral (horizontal) movement or spreading away from the point of introduction to the subsurface.
- Review of stratigraphic information presented in the RI boring logs indicates that there is at least one distinct unsaturated zone stratum that was encountered and recorded in the investigative borings. This stratum is a well-cemented fossiliferous sand consistently encountered between 30 and 40 feet bgs, that appears to be laterally continuous beneath the DAC C6 and Montrose properties. Plotting the depth to occurrence of the fossiliferous sand indicates that this unit dips to the north on an angle of about one and one-half degrees from horizontal beneath Montrose. Regional geologic stratigraphy supports this structural orientation, i.e., the DAC C6 Facility and Montrose Site are located above the north-dipping arm of the Torrance Anticline. Because of the well-cemented fossiliferous zone and the implication that other unsaturated (and uppermost saturated) strata beneath the site also dip to the north, structurally-influenced preferential migration to the north of liquids percolating downward in the unsaturated zone to the water table is a viable hypothesis.
- The prolonged presence of a recharge mound during the years that the wastewater settling pond was unlined, would have resulted in localized areas of pronounced northerly flow conditions in the shallow groundwater beneath the Montrose Site. Because of the low hydraulic conductivity of the sediments comprising the Upper Bellflower Aquitard and the relatively flat hydraulic gradient in the aquitard, chemicals introduced into the shallow groundwater of the Upper Bellflower Aquitard in significant concentrations might remain for many years following dissipation of the recharge mound. This is because groundwater movement

is normally extremely slow, significant sorption of organic chemicals to the fine-grained sediments probably occurs, and "flushing" of the uppermost saturated portion of the aquitard would not occur at a significant rate.

It is our opinion that the findings of the technical document review and groundwater sample analyses are sufficient to affirmatively conclude that chloroform and chlorobenzene occurrence in the Upper Bellflower Aquitard at the location of monitoring well MW-09 is associated with chemical releases at the Montrose Site. In our opinion, it is unnecessary for DAC to conduct any additional investigations.

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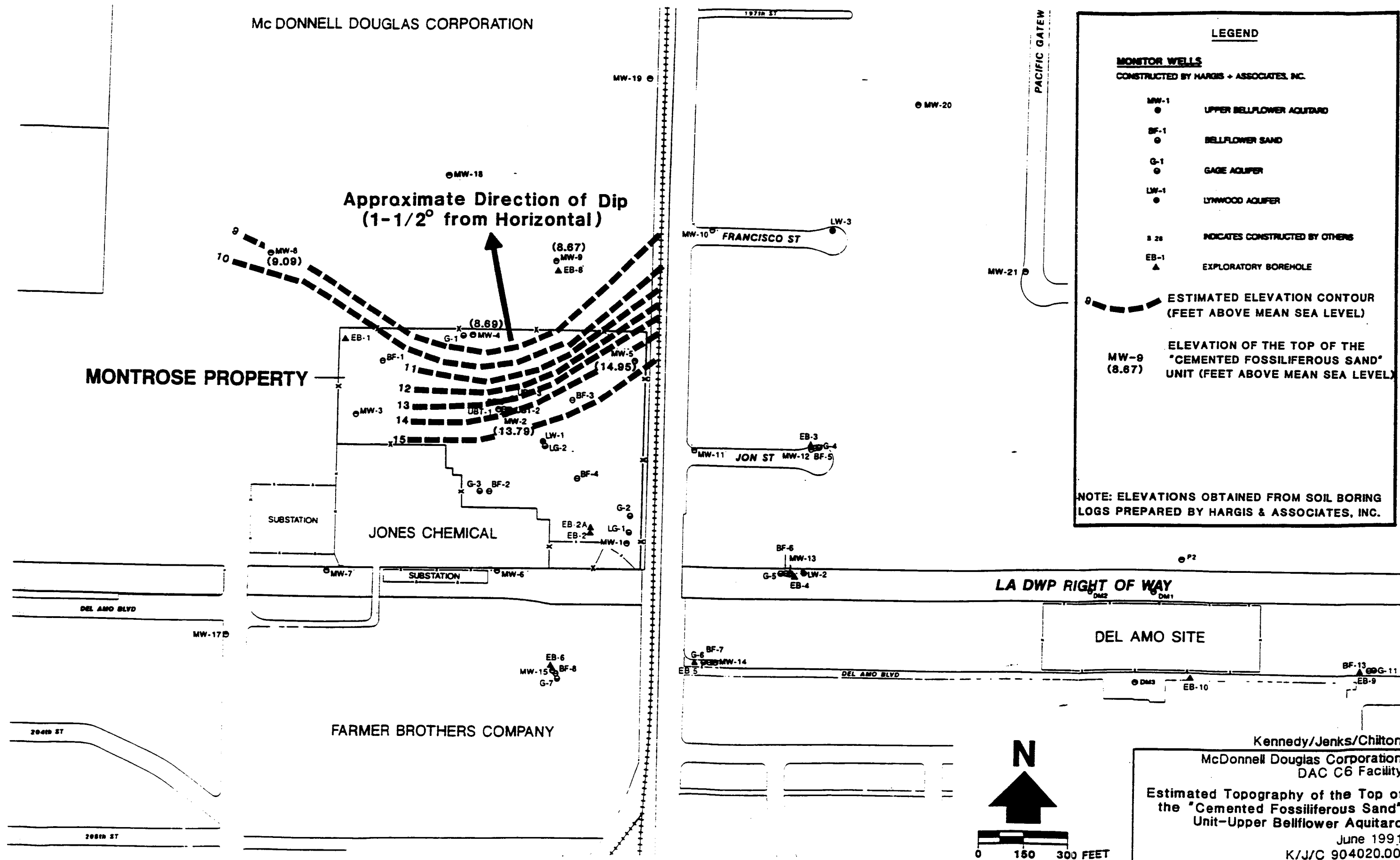
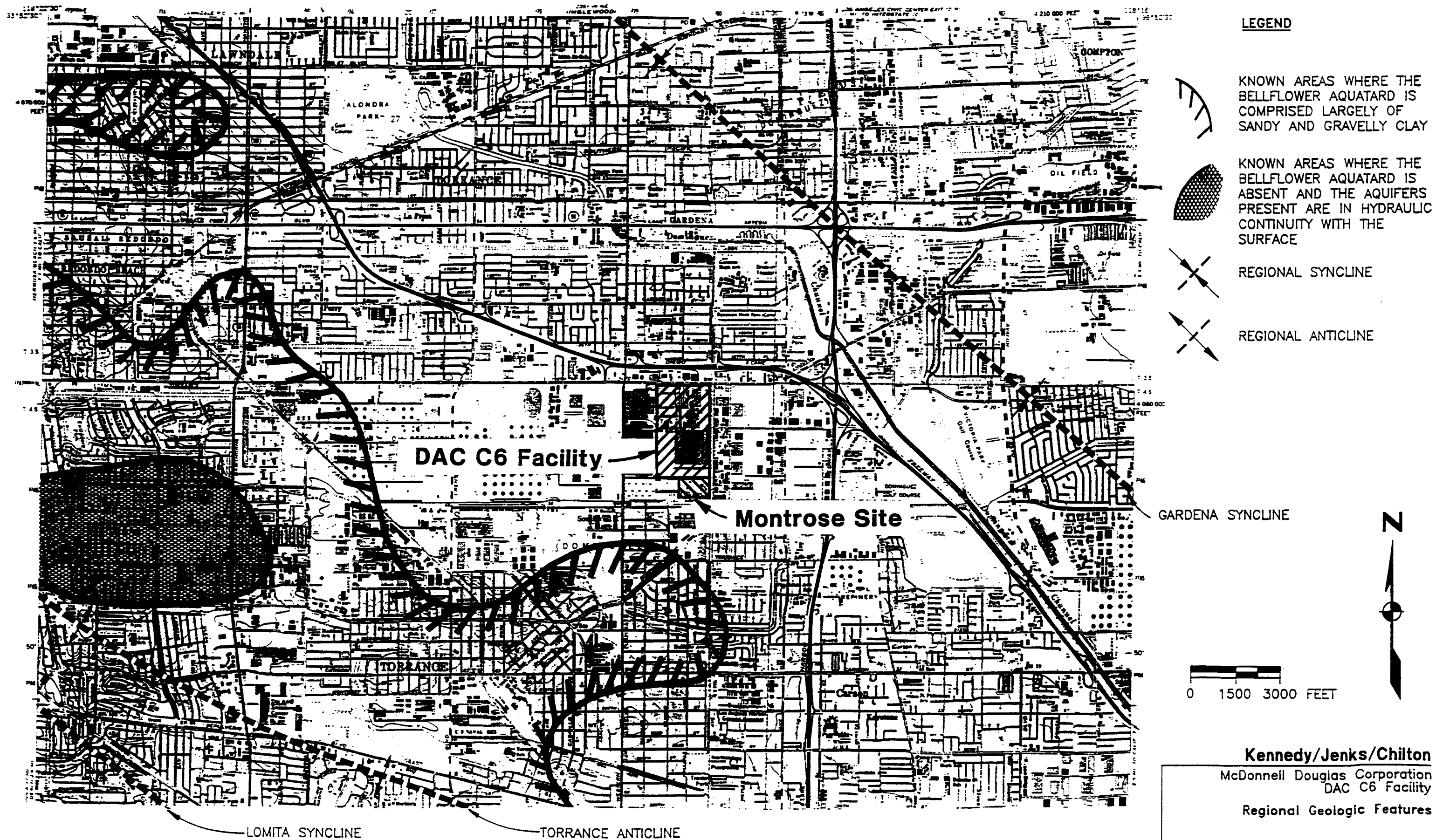


Figure 4-1

BOE-C6-0071775

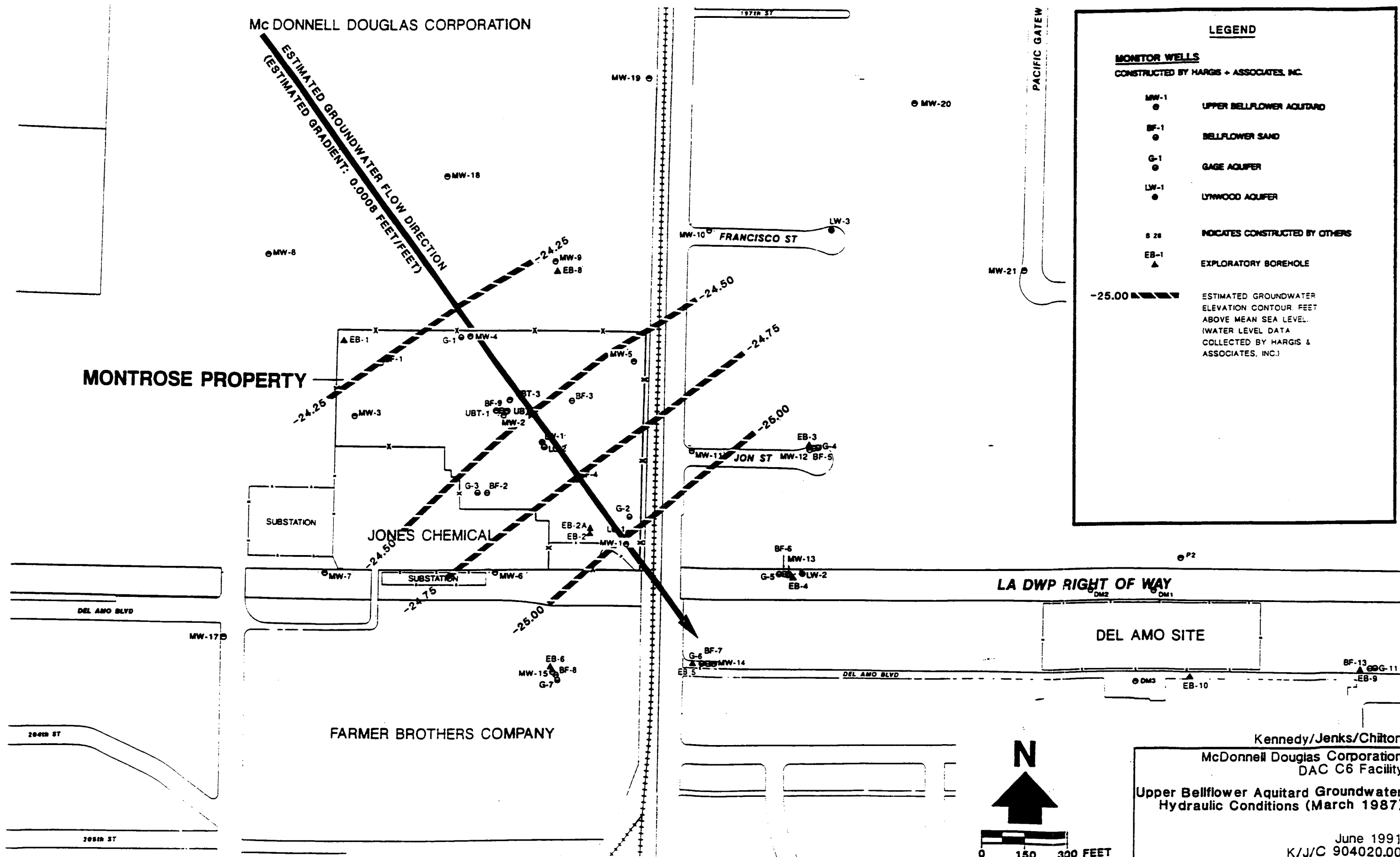


Base Map Source: U.S.G.S. 7.5 Minute Topographic Map,
Torrance, California Quaarangie.

Kennedy/Jenks/Chilton
McDonnell Douglas Corporation
DAC C6 Facility
Regional Geologic Features

June 1991
K/J 904020.00

Figure 4-2

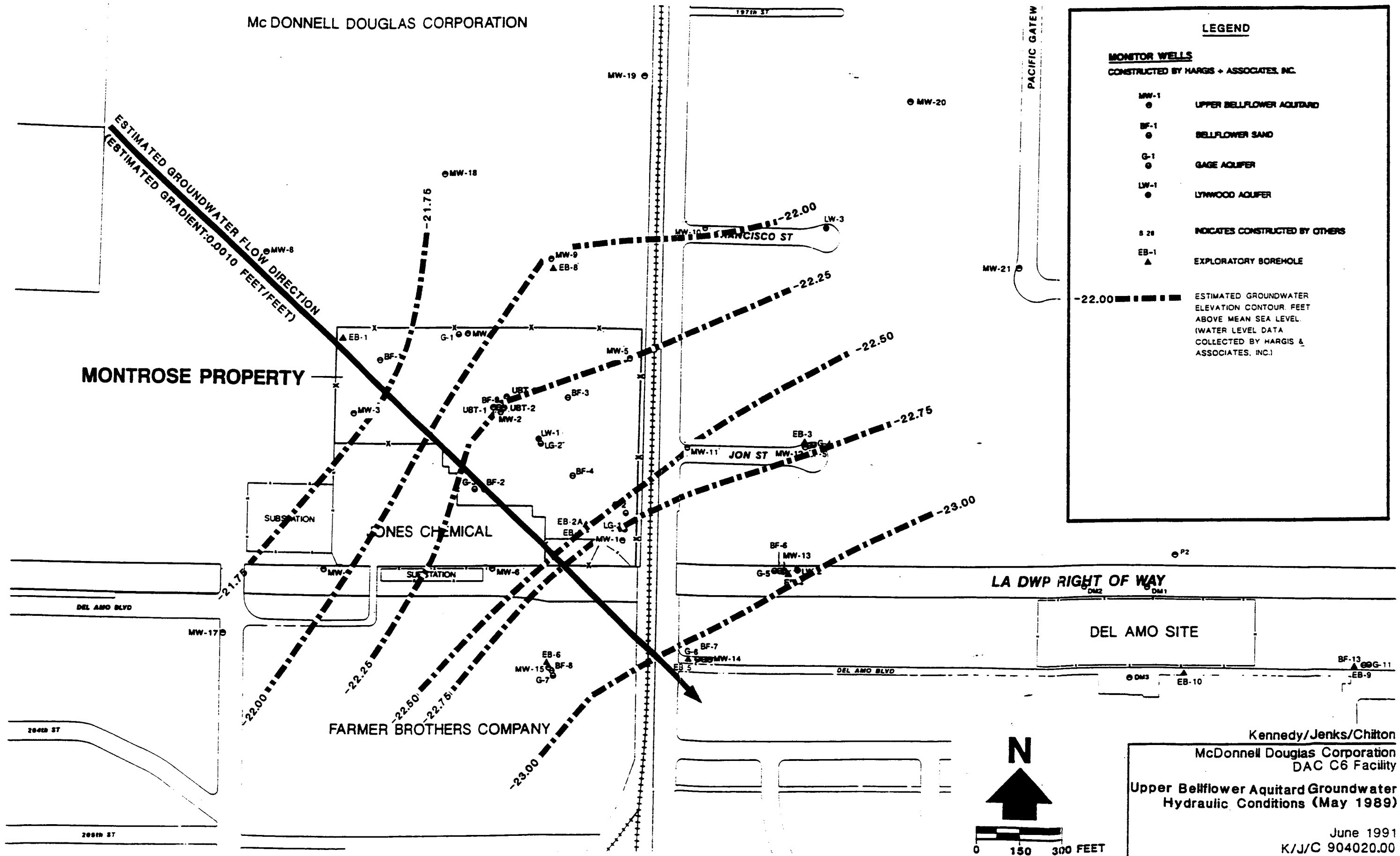


Base Map Source: Hargis & Associates Inc., 4/90, Monitor Wells & Exploratory Boreholes, Montrose Site & Vicinity, Torrance, California, Figure 1.

Kennedy/Jenks/Chilton
McDonnell Douglas Corporation
DAC C6 Facility
Upper Bellflower Aquitard Groundwater
Hydraulic Conditions (March 1987)

June 1991
K/J/C 904020.00

Figure 4-3

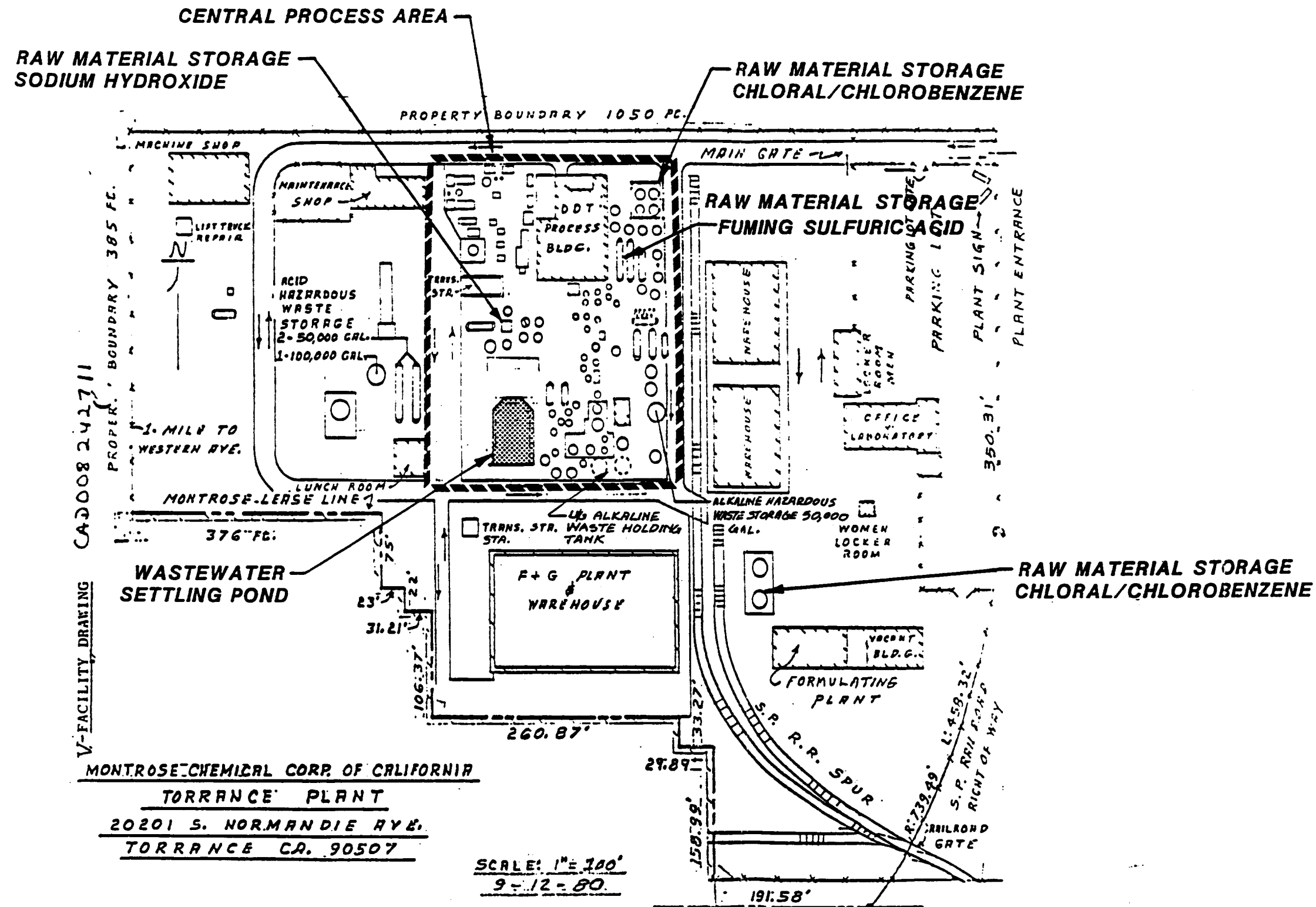


Base Map Source: Hargis & Associates Inc., 4/90, Monitor Wells & Exploratory Boreholes, Montrose Site & Vicinity, Torrance, California, Figure 1.

Kennedy/Jenks/Chilton
McDonnell Douglas Corporation
DAC C6 Facility
Upper Bellflower Aquitard Groundwater
Hydraulic Conditions (May 1989)

June 1991
K/J/C 904020.00

Figure 4-4



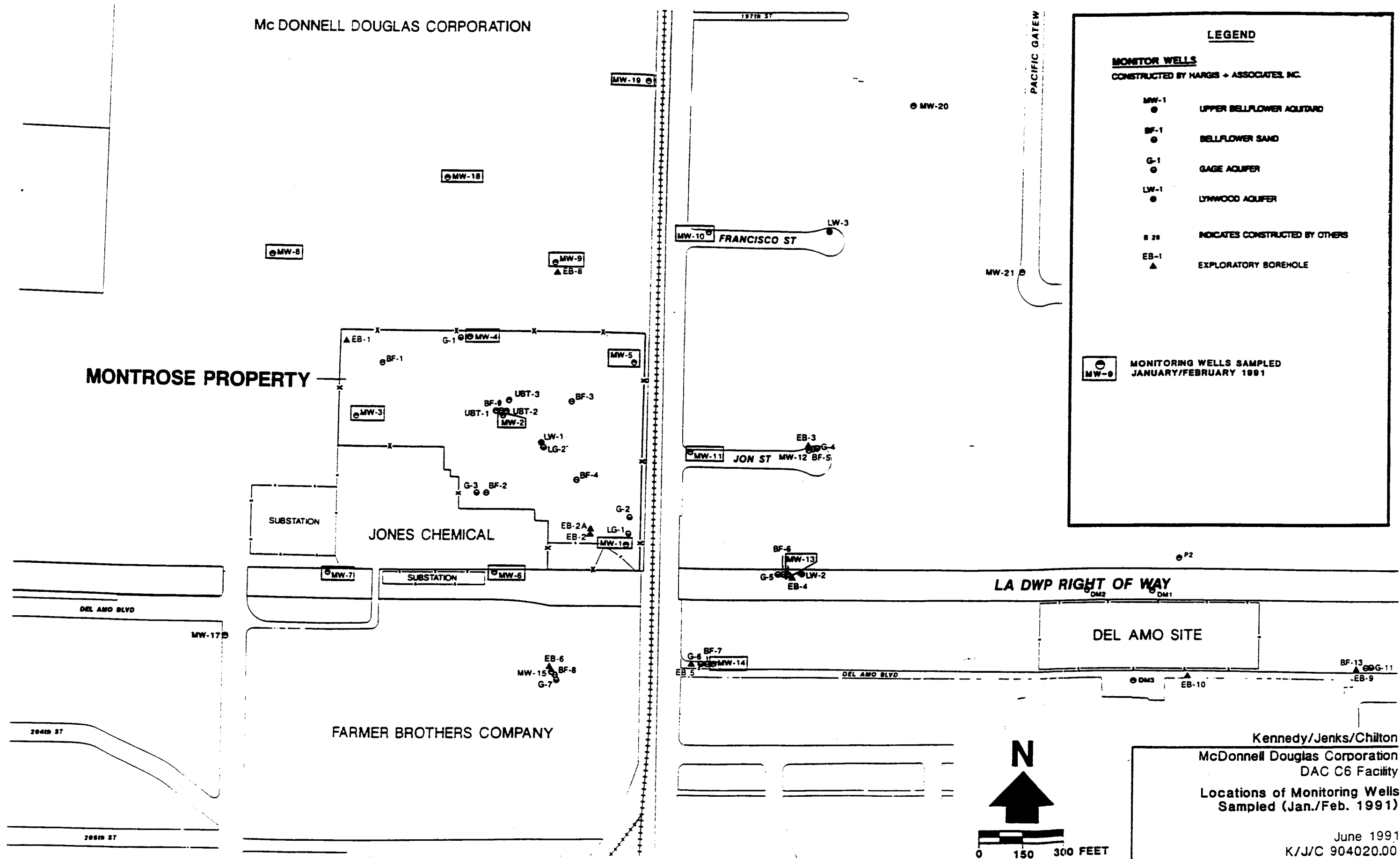
Kennedy/Jenks/Chilton
McDonnell Douglas Corporation
DAC C6 Facility
Montrose Chemical Facility Layout

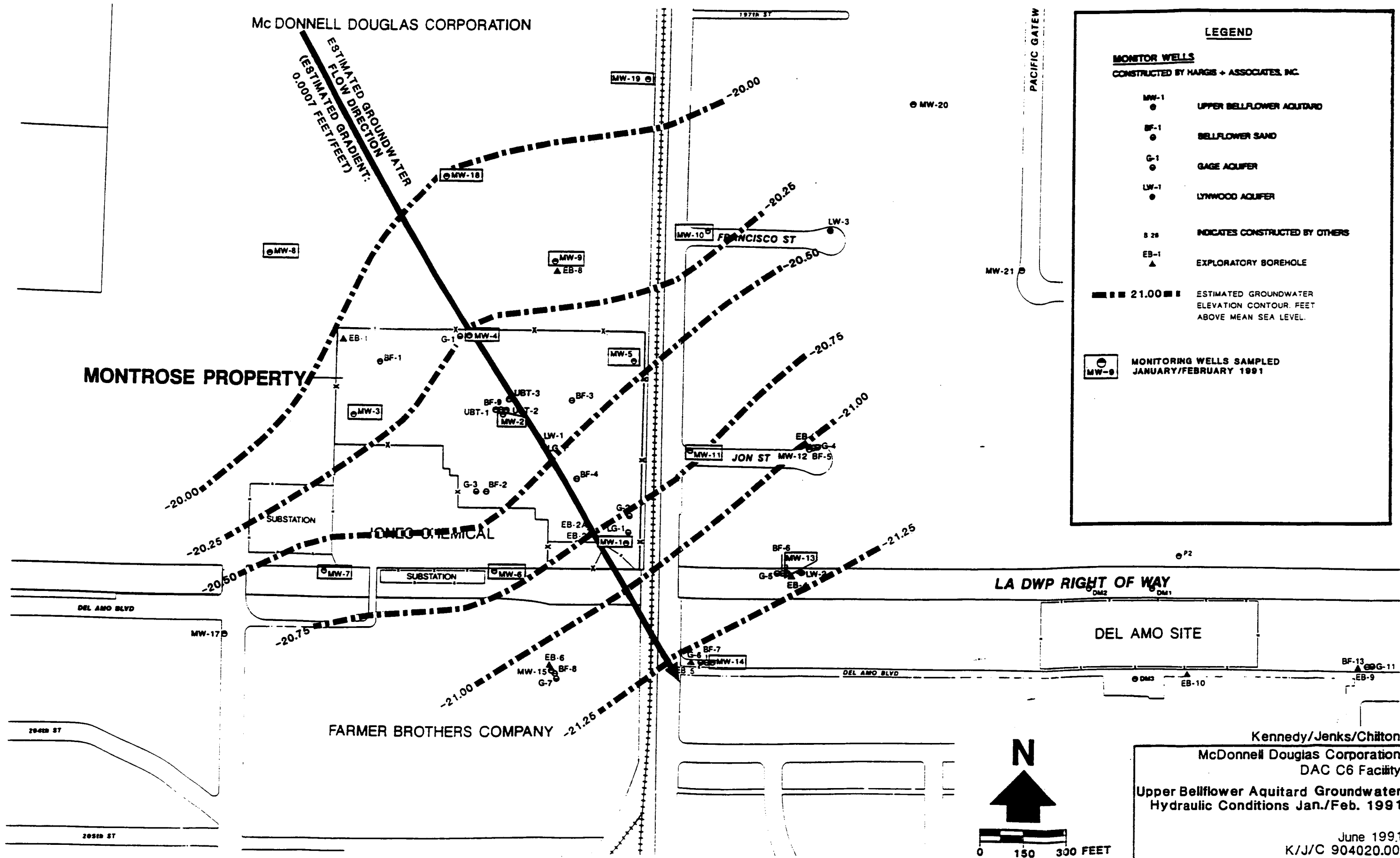
June 1991
K/J/C 904020.00

Figure 5-1

Source: Layout Drawn By Montrose Chemical Corporation Of California 3-12-80.
Drawing Obtained From The California Department Of Health Services Files.

BOE-C6-0071779





LEGEND

MONITOR WELLS
CONSTRUCTED BY HARGIS & ASSOCIATES, INC.

MW-1	●	UPPER BELLFLOWER AQUITARD
BF-1	●	BELLFLOWER SAND
G-1	●	GAGE AQUIFER
LW-1	●	LYNWOOD AQUIFER
8 28		INDICATES CONSTRUCTED BY OTHERS
EB-1	▲	EXPLORATORY BOREHOLE

■ ■ ■ 21.00 ■ ■ ■ ESTIMATED GROUNDWATER ELEVATION CONTOUR, FEET ABOVE MEAN SEA LEVEL.

● MW-9 MONITORING WELLS SAMPLED JANUARY/FEBRUARY 1991

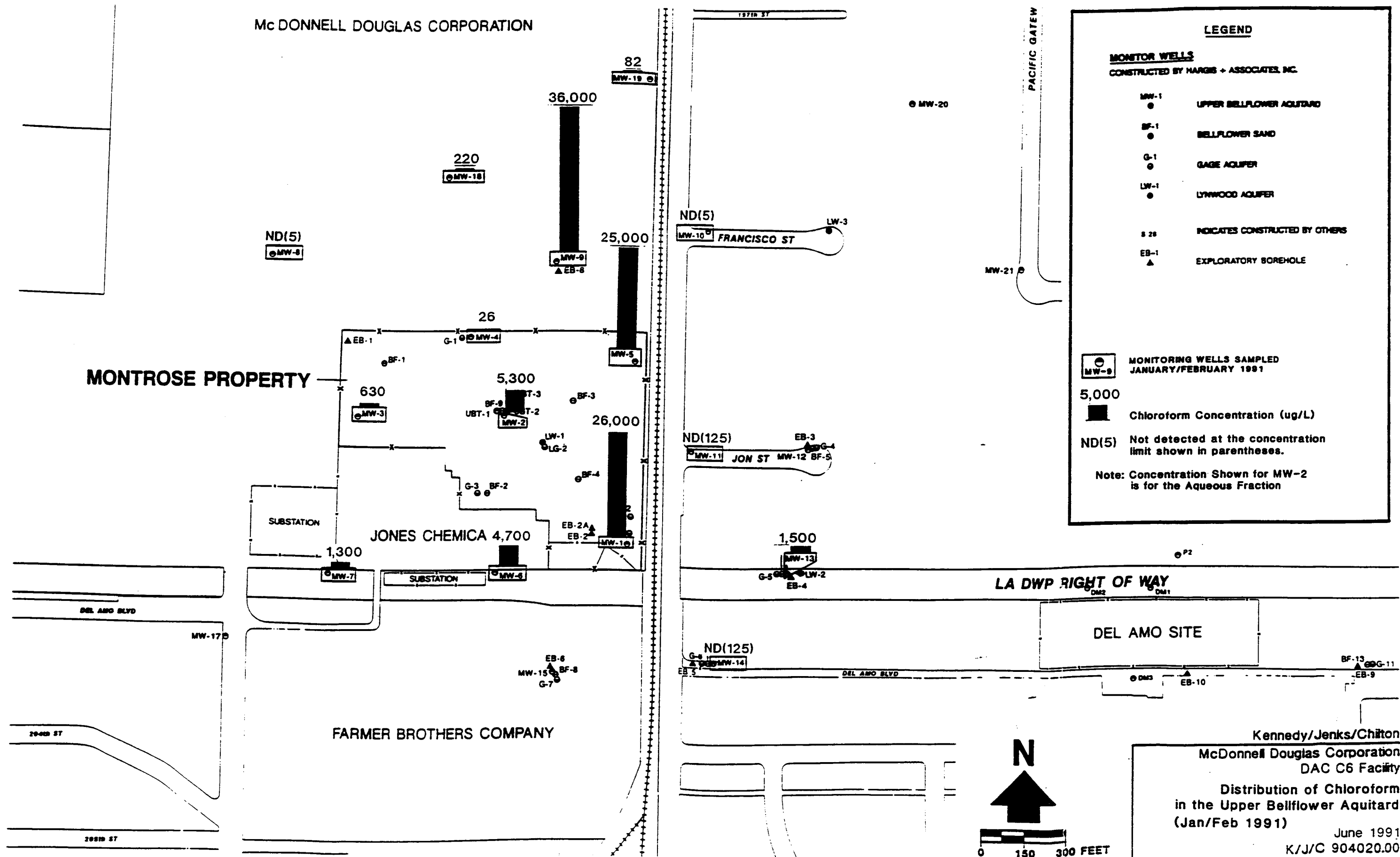
Base Map Source: Hargis & Associates Inc., 4/80, Monitor Wells & Exploratory Boreholes, Montrose Site & Vicinity, Torrance, California, Figure 1.

Kennedy/Jenks/Chilton
McDonnell Douglas Corporation
DAC C6 Facility
Upper Bellflower Aquitard Groundwater
Hydraulic Conditions Jan./Feb. 1991

June 1991
K/J/C 904020.00

Figure 6-2

BOE-C6-0071781



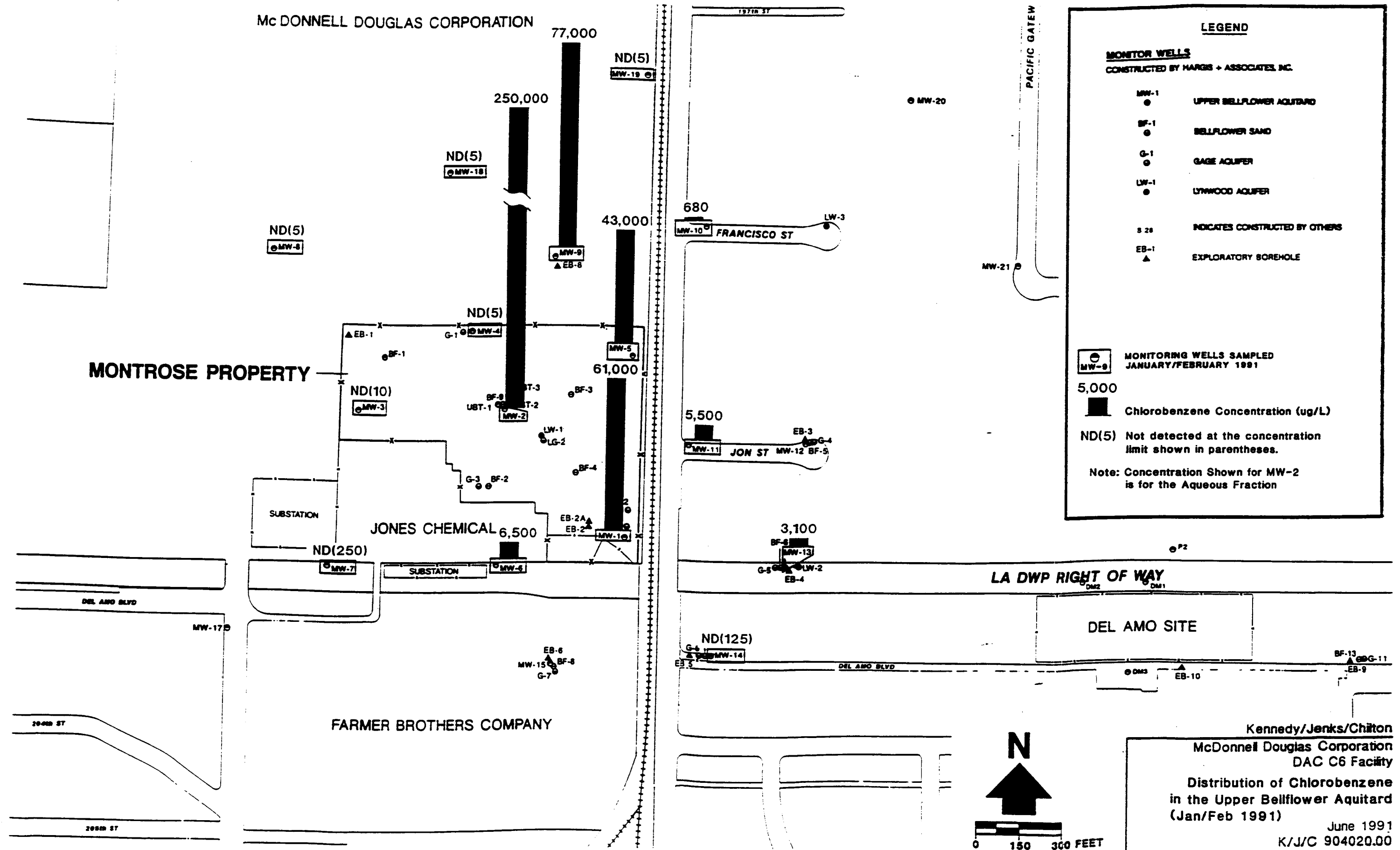
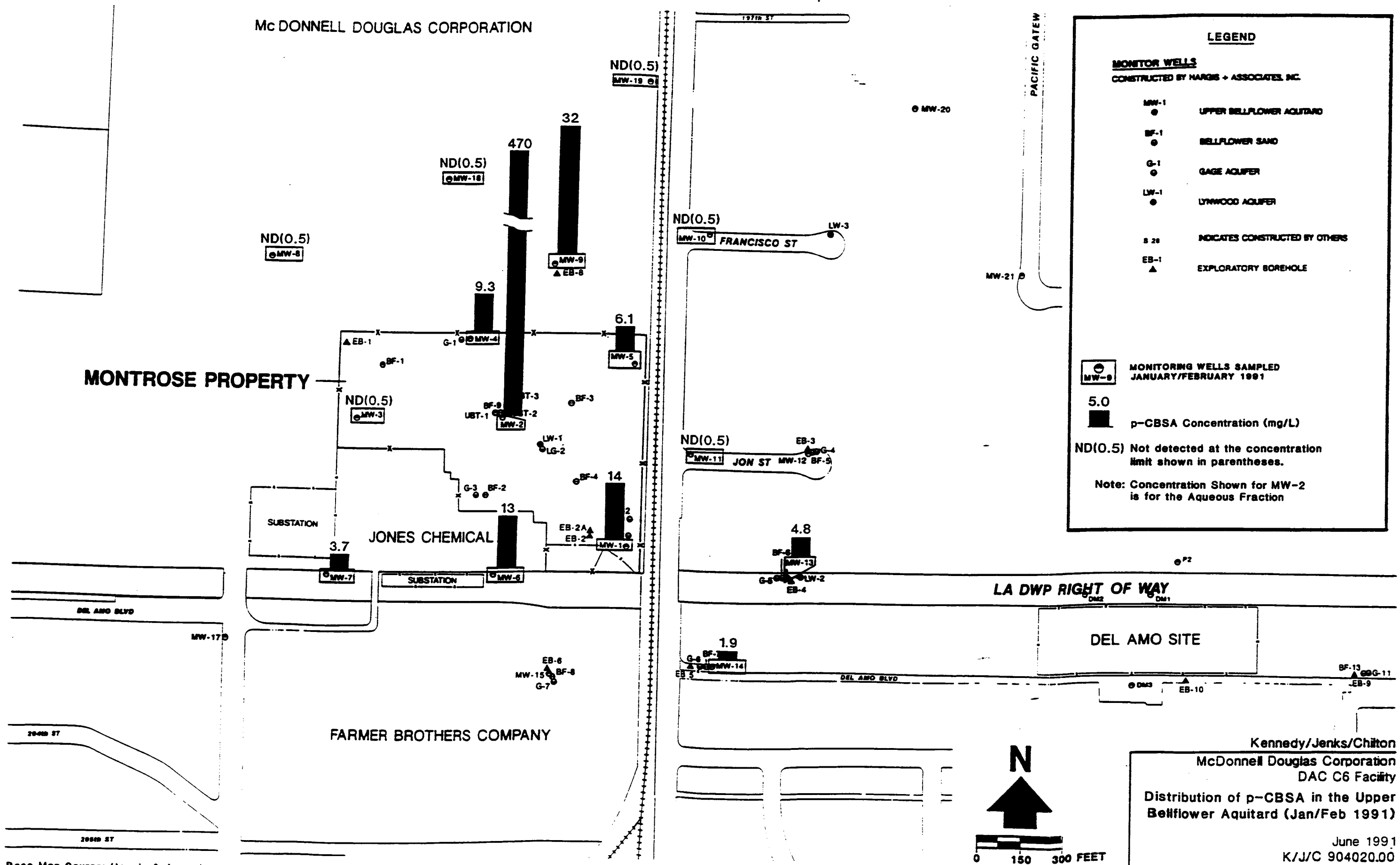
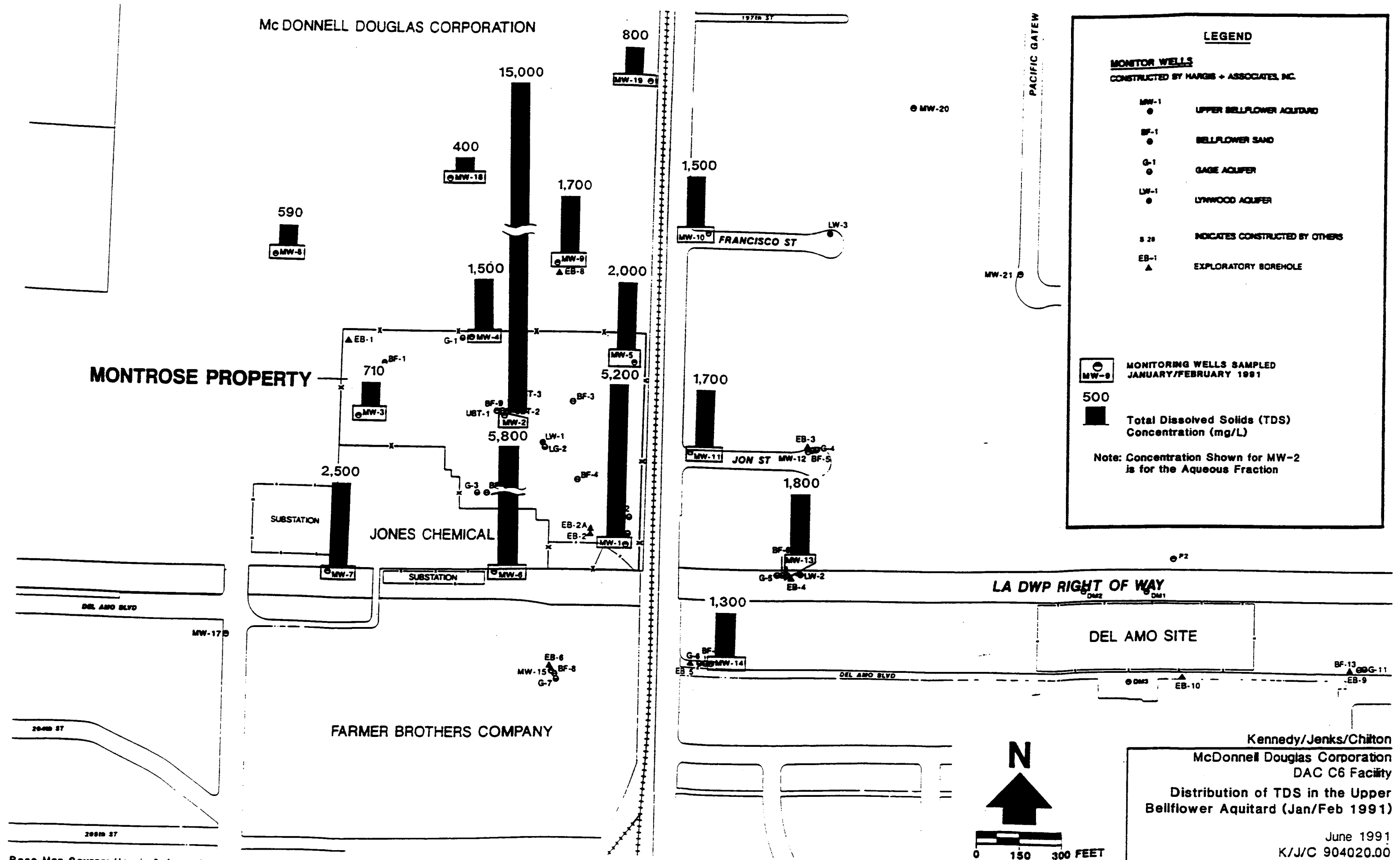
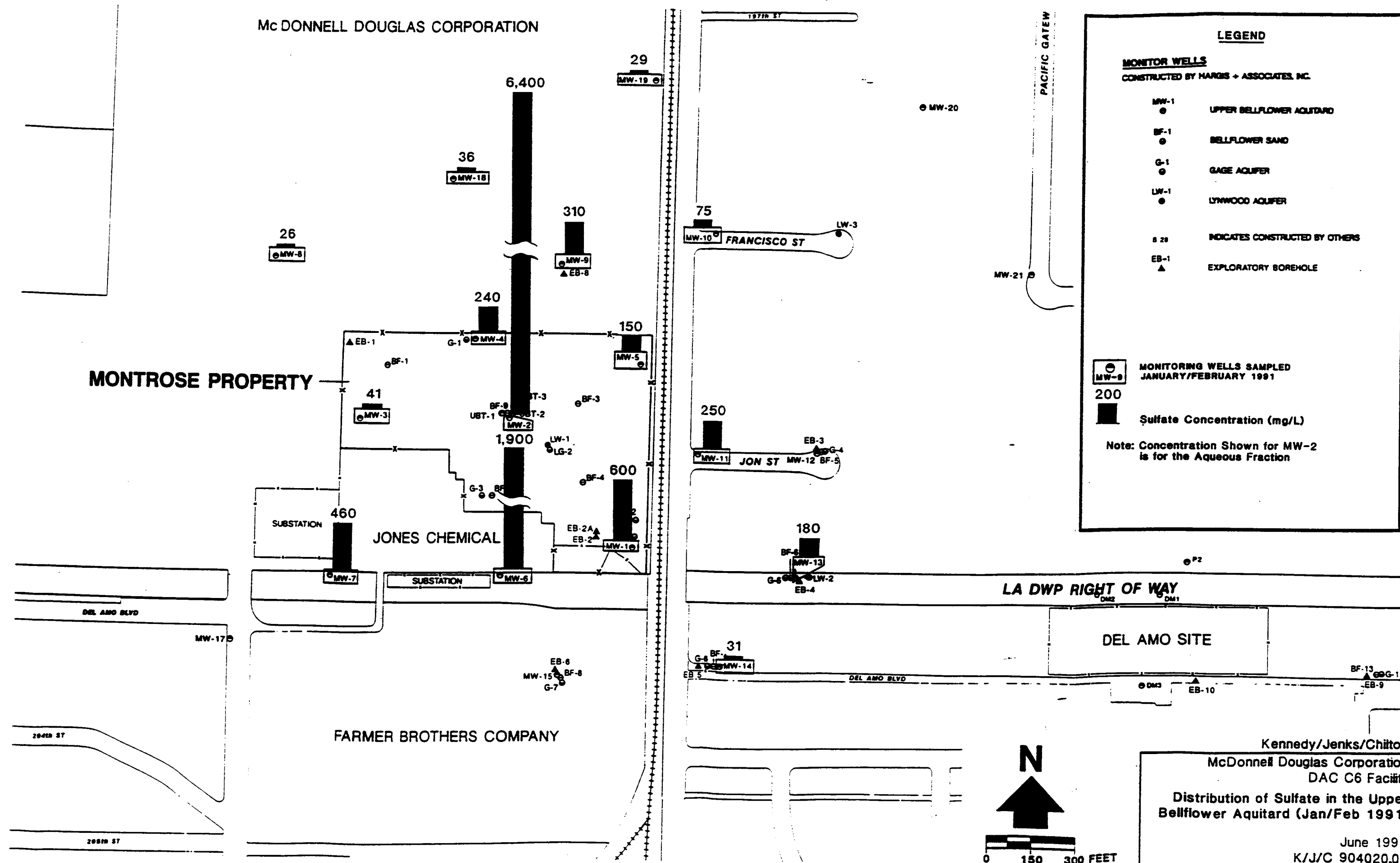


Figure 6-4





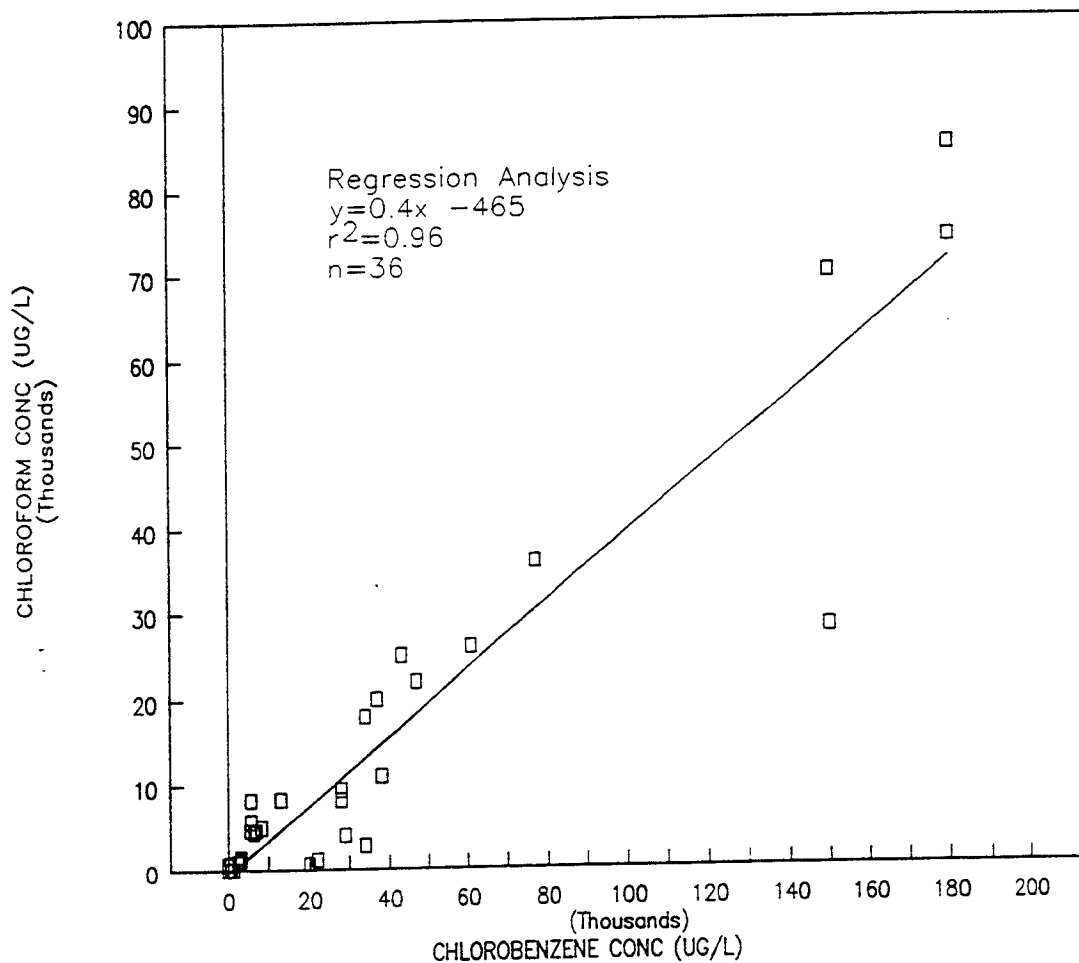
BOE-C6-0071785



Kennedy/Jenks/Chilton
McDonnell Douglas Corporation
DAC C6 Facility
Distribution of Sulfate in the Upper
Bellflower Aquitard (Jan/Feb 1991)

June 1991
K/J/C 904020.00

Figure 6-7



Note: Data Includes Concentrations of Chloroform and Chlorobenzene in Groundwater Samples Collected From Monitoring Wells MW-01, MW-03, MW-04, MW-05, MW-06, MW-07, MW-09, MW-10, MW-11, MW-12, MW-13 and MW-17 During the Following Sampling Events: April/May 1989, October 1989, February 1990, April 1990 and January/February 1991.

Kennedy/Jenks/Chilton

McDonnell Douglas Corporation
 DAC C6 Facility

Plot of Chloroform and Chlorobenzene Concentrations. Montrose Site Groundwater Samples—Upper Bellflower Aquitard

June 1991
 K/J/C 904020.00

Figure 5-2

11X17

6-1

thru

6-7

behind

fig 5-2

APPENDIX A

Chain-of-Custody Documents

Kennedy/Jenks/Chilton
Laboratory Division

KJJC Job No. 904020.00

Affiliation K/J/C

Address _____

Phone _____

Note: Analysis Request to Follow

[illegible]

*1 VOC w/o HCL kept @ K/S/C-Irvine
1 gal Amber glass also to remain @ K/S/C-Irvine

	Relinquished by (Signature and affiliation)	Date	Time	Received by (3) (Signature and affiliation)	Date	Time
1.	<u>Paul Stanfield</u> <u>N/J/C - Irvine</u>	<u>1/31</u>	<u>2:30</u>	<u>[Signature]</u> <u>ESIC</u>	<u>2/1/91</u>	<u>11:00</u>
2.	_____	_____	_____	_____	_____	_____

Logged In at KJ/C by P. Chang 1/1/11

Note: Top (Original) copy to laboratory with samples.

Lab-8 (LA)
Rev. 12/8

Field Sample Chain of Custody Record

Kennedy/Jenks/Chilton
Laboratory Division

Source of Sample (s) DAC

Address Torrance & L.A.

Phone _____
Report to Jim Lenoci

KJ/C Job No. 904020.00
Collector J. Lenoci
Affiliation K/J/C
Address 17310 Red Hill No. 22
Irvine, CA 92714
Phone 714 261 1577

Sample Information (1)

Lab No. (Lab Use Only)	Field No.	Date	Time	Type (2)	Depth	Remarks (Suspected Contaminants, Containers, Preservatives, Field Conditions, etc.)
✓ MW18-K1		1/30/90	1000	W		PCBSA by IC
✓ MW19-K1		1/30/90	1120	W		"
✓ MW08-K1		1/30/90	1320	W		"
✓ DUP1-K1		1/30/90	1330	W		"
✓ MW10-K1		1/30/90	1505	W		"
✓ MW13-K1		1/30/90	1705	W		"

Chain of Possession

	Relinquished by (Signature and affiliation)	Date	Time	Received by (3) (Signature and affiliation)	Date	Time
1.	<u>Phil Scanfield</u>	<u>1/31</u>	<u>3:30</u>	<u>Mary Mulcahey</u>	<u>1-31-91</u>	<u>3:30p</u>
2.						

Logged in at KJ/C by _____

- (1) A separate Laboratory Analysis Request Form is to be filled out by the collector and given to the laboratory when samples are delivered.
(2) e.g. water, sludge, soil, etc.
(3) If any samples are not intact at time of transfer, please describe on the back of this form.
Each batch of 10 or fewer samples of each matrix type (soil, water, etc.) must include enough of one sample for triplicate analysis.
WARNING: These samples contain unknown chemicals which, upon analysis, may be determined to be "known to the State to cause cancer or reproductive toxicity," under the California Safe Drinking Water and Toxics Enforcement Act of 1986 (Proposition 65).
Note: Top (Original) copy to laboratory with samples.

Lab-6 (LAB
Rev. 12/88

Kennedy/Jenks/Chilton
Laboratory Division

KJJC Job No. 90402000

Collector C. S. Townsend / E. L. Lamer

Affiliation K/S/C

Address _____

Phone _____

Report to Wm. L. Brown (Irvine - Ref 1)

Phone _____

Lab No. (Lab Use Only)	Field No.	Date	Time	Type (2)	Depth	*Remarks (Suspected Contaminants, Containers, Preservatives, Field Conditions, etc.)
710805	MW-14-K1	1/31/91	0845	W	-	1x gal. w/NP; 1x 1/2 gal. w/NP; 1x 500 ml. w/NP; 1x 500 ml. w/HNO ₃ ; 3x VOC's w/NP; 2x VOC's w/NP; 1x 500 ml. w/HNO ₃ ; 1x 500 ml. w/HNO ₃
806	E-Bk w/C	"	1030	W	-	1x VOC's w/NP; 2x VOC's w/NP; 1x gal. w/NP; 1x 1/2 gal. w/NP; 1x 500 ml. w/NP
807	MW-11-K1	"	1110	W	-	1x 500 ml. w/HNO ₃ ; 3x VOC's w/NP; 2x VOC's w/NP
808	MW-11-Spr	"	1110	W	-	2x VOC's w/1M HCL; 1x VOC's w/NP 1x gal. w/NP; 1x 1/2 gal. w/NP; 1x 500 ml. w/NP
809	MW-06-K1	"	1346	W	-	1x 500 ml. w/HNO ₃ ; 3x VOC's w/NP; 2x VOC's w/NP
810	MW-07-K1	"	1520	W	-	" 1x gal. w/NP; 3x VOC's w/NP; 2x VOC's w/NP
811	MW-03-K1	"	1710	W	-	2x 500 ml. w/HNO ₃ ; 2x VOC's w/NP
812	T-Bk w/C	1/29/91	-	-	-	2x VOC's w/1M HCL

Note:

2. Samplers were delivered by Fed. Ex to Lab on Sat. (2/2/91)
1.1 Analysis Request to Follow

* Lab Analysis Request to Follow
* 1/3-1 glass to remain in Irvine.

Relinquished by			Received by (3)		
(Signature and affiliation)	Date	Time	(Signature and affiliation)	Date	Time
1. _____	_____	_____	<u>T. Nelson</u>	<u>2/3/91</u>	<u>230</u>
_____	_____	_____	<u>KIT/C UL</u>	_____	_____
2. _____	_____	_____	_____	_____	_____
_____	_____	_____	_____	_____	_____

Logged In at KJ/C by T. Nelson 2/3/91 230

Note: Top (Original) copy to laboratory with samples.

Lab-8 (LAB)
Rev.-12/88

Field Sample Chain of Custody Record

Kennedy/Jenks/Chilton
Laboratory Division

Source of Sample (s) DAC

KJ/C Job No. 904020.00
Collector Jim Lenoci / Chris Slumberg

Address Torrance & L.A.

Affiliation K / J / C

Phone _____

Address 17310 Red Hill Ave, Suite 22

Report to Jim Lenoci

Phone 714 261 1577

Sample Information (1)

Lab No. (Lab Use Only)	Field No.	Date	Time	Type (2)	Depth	Remarks (Suspected Contaminants, Containers, Preservatives, Field Conditions, etc.)
<u>✓ MW/L-K1</u>	<u>1/31/91</u>	<u>0945</u>	<u>W</u>	<u>-</u>	<u>1 gal amber glass</u>	
<u>✓ MW11-K1</u>	<u>1/31/91</u>	<u>1110</u>	<u>W</u>	<u>-</u>	<u>"</u>	
<u>✓ MW06-K1</u>	<u>1/31/91</u>	<u>1346</u>	<u>W</u>	<u>-</u>	<u>"</u>	
<u>✓ MW07-K1</u>	<u>1/31/91</u>	<u>1520</u>	<u>W</u>	<u>-</u>	<u>"</u>	
<u>✓ MW-03-K1</u>	<u>1/31/91</u>	<u>1710</u>	<u>W</u>	<u>-</u>	<u>"</u>	
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>
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<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>	<u> </u>

Chain of Possession

b 17752

Relinquished by (Signature and affiliation)	Date	Time	Received by (3) (Signature and affiliation)	Date	Time
<u>[Signature]</u> <u>K / J / C</u>	<u>2/1/91</u>	<u>1307</u>	<u>Bab O. Brown</u> <u>WKAS</u>	<u>2/1/91</u>	<u>1:10pm</u>

Logged in at KJ/C by _____

- 1) A separate Laboratory Analysis Request Form is to be filled out by the collector and given to the laboratory when samples are delivered.
- 2) e.g. water, sludge, soil, etc.
- 3) If any samples are not intact at time of transfer, please describe on the back of this form.

Each batch of 10 or fewer samples of each matrix type (soil, water, etc.) must include enough of one sample for triplicate analysis.

WARNING These samples contain unknown chemicals which, upon analysis, may be determined to be "known to the State to cause cancer or reproductive toxicity," under the California Safe Drinking Water and Toxics Enforcement Act of 1986 (Proposition 65).

Note: Top (Original) copy to laboratory with samples.

Lab-6 (LAB)
Rev. 12/88

Field Sample Chain of Custody Record

Kennedy/Jenks/Chilton
Laboratory DivisionSource of Sample (s) DACKJ/C Job No. 954220.00Collector C. Strickland / T. Lencsi

Address _____

Affiliation K/J/C

Address _____

Phone _____

Report to Tim Lencsi (Irvine-K/J/C)

Phone _____

Sample Information (1)

Note: Lab Request to Follow

Lab No. (Lab Use Only)	Field No.	Date	Time	Type (2)	Depth	Remarks (Suspected Contaminants, Containers, Preservatives, Field Conditions, etc.)
<u>MW-04 KI</u>		<u>2/1/91</u>	<u>1015</u>	<u>W</u>	<u>-</u>	<u>1.25 ml w/ 1/2 500 ml w/ NP; 1x 500 ml w/ NP</u>
<u>F-Blank</u>		<u>"</u>	<u>0930</u>	<u>W</u>	<u>-</u>	<u>"</u>
<u>MW-05 KI</u>		<u>"</u>	<u>1150</u>	<u>W</u>	<u>-</u>	<u>"</u>
<u>DUP 2-KI</u>		<u>"</u>	<u>1145</u>	<u>W</u>	<u>-</u>	<u>"</u>
<u>MW-01 KI</u>		<u>"</u>	<u>1300</u>	<u>W</u>	<u>-</u>	<u>1.25 ml w/ 1/2 500 ml w/ NP; 1x 500 ml w/ NP</u>
<u>MW-02 KI</u>		<u>"</u>	<u>1345</u>	<u>W</u>	<u>-</u>	<u>3x 500 ml w/ NP; 3x 500 ml w/ NP</u>
<u>MW-09 KI</u>		<u>"</u>	<u>1600</u>	<u>W</u>	<u>-</u>	<u>1.25 ml w/ 1/2 500 ml w/ NP; 1x 500 ml w/ NP</u>
<u>T-Blank</u>				<u>W</u>	<u>-</u>	<u>1x 500 ml w/ 1/2 HCL</u>

* 1 gal glass to remain in Irvine

Chain of Possession

Relinquished by (Signature and affiliation)	Date	Time	Received by (3) (Signature and affiliation)	Date	Time
1. <u>James T. Lencsi</u> <u>K/J/C - Irvine</u>	<u>2/4/91</u>	<u>1800</u>	<u>Federal Express</u>	<u>2/4/91</u>	<u>1800</u>
2. _____	_____	_____	_____	_____	_____

Logged in at KJ/C by _____

(1) A separate Laboratory Analysis Request Form is to be filled out by the collector and given to the laboratory when samples are delivered.

(2) e.g. water, sludge, soil, etc.

(3) If any samples are not intact at time of transfer, please describe on the back of this form.

Each batch of 10 or fewer samples of each matrix type (soil, water, etc.) must include enough of one sample for triplicate analysis.

WARNING These samples contain unknown chemicals which, upon analysis, may be determined to be "known to the State to cause cancer or reproductive toxicity," under the California Safe Drinking Water and Toxics Enforcement Act of 1986 (Proposition 65).

Note: Top (Original) copy to laboratory with samples.

Lab-6 (LAB)
Rev. 12/86

BOE-C6-0071794

Source of Sample (s) DACKJ/C Job No. 904020.00Address LA & TorranceCollector Jim LenociAffiliation K/J/C

Phone _____

Address 17310 Red Hill, NoIrvine, CA 92714Report to Jim LenociPhone 714 261 1577

Sample Information (1)

Lab No. (Lab Use Only)	Field No.	Date	Time	Type (2)	Depth	Remarks (Suspected Contaminants, Containers, Preservatives, Field Conditions, etc.)
<u>FLD BLNK</u>	<u>✓</u>	<u>2/1/91</u>	<u>0930</u>	<u>W</u>	<u>-</u>	<u>1/2 gal, 50% full plastic</u>
<u>MW04-K1</u>	<u>✓</u>	<u>2/1/91</u>	<u>1015</u>	<u>W</u>	<u>-</u>	<u>1 gal amber glass</u>
<u>MW05-K1</u>	<u>✓</u>	<u>2/1/91</u>	<u>1150</u>	<u>W</u>	<u>-</u>	<u>"</u>
<u>DUP2-K1</u>	<u>✓</u>	<u>2/1/91</u>	<u>1145</u>	<u>W</u>	<u>-</u>	<u>"</u>
<u>MW01-K1</u>	<u>✓</u>	<u>2/1/91</u>	<u>1300</u>	<u>W</u>	<u>-</u>	<u>"</u>
<u>MW02-K1-NA*</u>	<u>✓</u>	<u>2/1/91</u>	<u>1345</u>	<u>W</u>	<u>-</u>	<u>1 l glass</u>
<u>MW02-K1-AQ**</u>	<u>✓</u>	<u>2/1/91</u>	<u>1345</u>	<u>W</u>	<u>-</u>	<u>1 l glass</u>
<u>MW09-K1</u>	<u>✓</u>	<u>2/1/91</u>	<u>1600</u>	<u>W</u>	<u>-</u>	<u>1 gal glass</u>

Chain of Possession

* Dense Non-Aqueous Phase Liquid (DNAPL)
 ** Aqueous phase above the DNAPL - same container

Relinquished by (Signature and affiliation)	Date	Time	Received by (3) (Signature and affiliation)	Date	Time
1. <u>[Signature]</u> <u>K/J/C</u>	<u>2/4/91</u>	<u>4:35</u>	<u>[Signature]</u> <u>WCAS</u>	<u>2/4/91</u>	<u>4:41</u>
2. _____	_____	_____	_____	_____	_____

Logged in at KJ/C by _____

(1) A separate Laboratory Analysis Request Form is to be filled out by the collector and given to the laboratory when samples are delivered.

(2) e.g. water, sludge, soil, etc.

(3) If any samples are not intact at time of transfer, please describe on the back of this form.

Each batch of 10 or fewer samples of each matrix type (soil, water, etc.) must include enough of one sample for triplicate analysis.

WARNING These samples contain unknown chemicals which, upon analysis, may be determined to be "known to the State to cause cancer or reproductive toxicity" under the California Safe Drinking Water and Toxics Enforcement Act of 1986 (Proposition 65).

Note: Top (Original) copy to laboratory with samples.

APPENDIX B

**GC/MS Methodology for p-CBSA
West Coast Analytical Services, Inc.
Santa Fe Springs, California**

Aromatic Sulfonic Acids by GC/MS

An aliquot of sample is evaporated to residue using a rotary evaporator. The residue is extracted with ether. The extract is dried with sodium sulfate and then concentrated to approximately 5 mL using a Kuderna-Danish apparatus. The concentrated extract is then derivatized using diazomethane to form the methyl esters. The extract is taken to a final volume of 10 mL. This extract is then analyzed by GC/MS.

APPENDIX C

**Laboratory Reports
Volatile Organic Compounds**

<u>Well No.</u>	<u>Sample I.D.</u>
MW-01	MW-01-K1
MW-03	MW-03-K1
MW-04	MW-04-K1
MW-05	MW-05-K1
MW-06	MW-06-K1
MW-07	MW-07-K1
MW-08	MW-08-K1
MW-09	MW-09-K1
MW-10	MW-10-K1
MW-11	MW-11-K1
MW-13	MW-13-K1
MW-14	MW-14-K1
MW-18	MW-18-K1
MW-19	MW-19-K1

LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910890
Sample I.D.: MW-01-K1
Matrix: Water
Depth: —
Date Collected: 02/01/91
Time Collected: 1300
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<500	500	bromodichloromethane	<250	250
bromomethane	<500	500	1,2-dichloropropane	<250	250
vinyl chloride	<500	500	trans-1,3-dichloropropylene	<250	250
chloroethane	<500	500	trichloroethylene	<250	250
methylene chloride	370	250	benzene	12000	250
acrolein	<1500	1500	dibromochloromethane	<250	250
acrylonitrile	<500	500	cis-1,3-dichloropropylene	<250	250
trichlorofluoromethane	<250	250	1,1,2-trichloroethane	<250	250
1,1-dichloroethylene	<250	250	2-chloroethylvinyl ether	<250	250
1,1-dichloroethane	<250	250	bromoform	<250	250
1,2-dichloroethylene	<250	250	tetrachloroethylene	5700	250
chloroform *	26000	250	1,1,2,2-tetrachloroethane	<250	250
1,2-dichloroethane	<250	250	toluene	<250	250
1,1,1-trichloroethane	<250	250	chlorobenzene *	61000	250
carbon tetrachloride	<250	250	ethylbenzene	<250	250

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<1500	1500	vinyl acetate	<500	500
acetone	<500	500	4-methyl-2-pentanone	<500	500
carbon disulfide	<250	250	2-hexanone	<500	500
1,1,2-trichloro-			styrene	<250	250
1,2,2-trifluoroethane	<250	250	xylenes	<250	250
2-butanone	<500	500			

Comments: Results reported in micrograms per liter.

* Above the highest level of calibration.

Analyst Darrell Cain, Bill Svoboda

Manager



This report applies only to the sample investigated and is not necessarily indicative of the quality of apparently identical or similar samples. The liability of the laboratory is limited to the amount paid for the report by the issuee. The issuee assumes all liability for the further distribution of this report or its contents and by making such distribution agrees to hold the laboratory harmless against all claims of persons so informed of the contents hereof.

LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910811
Sample I.D.: MW-03-K1
Matrix: Water
Depth: —
Date Collected: 01/31/91
Time Collected: 1710
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<20	20	bromodichloromethane	<10	10
bromomethane	<20	20	1,2-dichloropropane	<10	10
vinyl chloride	<20	20	trans-1,3-dichloropropylene	<10	10
chloroethane	<20	20	trichloroethylene	28	10
methylene chloride	<10	10	benzene	<10	10
acrolein	<60	60	dibromochloromethane	<10	10
acrylonitrile	<20	20	cis-1,3-dichloropropylene	<10	10
trichlorofluoromethane	<10	10	1,1,2-trichloroethane	<10	10
1,1-dichloroethylene	<10	10	2-chloroethylvinyl ether	<10	10
1,1-dichloroethane	<10	10	bromoform	<10	10
1,2-dichloroethylene	<10	10	tetrachloroethylene	22	10
chloroform	630	10	1,1,2,2-tetrachloroethane	<10	10
1,2-dichloroethane	<10	10	toluene	<10	10
1,1,1-trichloroethane	<10	10	chlorobenzene	<10	10
carbon tetrachloride	<10	10	ethylbenzene	<10	10

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<60	60	vinyl acetate	<20	20
acetone	<20	20	4-methyl-2-pentanone	<20	20
carbon disulfide	<10	10	2-hexanone	<20	20
1,1,2-trichloro-			styrene	<10	10
1,2,2-trifluoroethane	<10	10	xylene	<10	10
2-butanone	<20	20			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager

Perrett Smith

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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910886
Sample I.D.: MW-04-K1
Matrix: Water
Depth: —
Date Collected: 02/01/91
Time Collected: 1015
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	300	5
chloroform	26	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager

Perrett Smith

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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910888
Sample I.D.: MW-05-K1
Matrix: Water
Depth: —
Date Collected: 02/01/91
Time Collected: 1150
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<2000	2000	bromodichloromethane	<1000	1000
bromomethane	<2000	2000	1,2-dichloropropane	<1000	1000
vinyl chloride	<2000	2000	trans-1,3-dichloropropylene	<1000	1000
chloroethane	<2000	2000	trichloroethylene	<1000	1000
methylene chloride	<1000	1000	benzene	<1000	1000
acrolein	<6000	6000	dibromochloromethane	<1000	1000
acrylonitrile	<2000	2000	cis-1,3-dichloropropylene	<1000	1000
trichlorofluoromethane	<1000	1000	1,1,2-trichloroethane	<1000	1000
1,1-dichloroethylene	<1000	1000	2-chloroethylvinyl ether	<1000	1000
1,1-dichloroethane	<1000	1000	bromoform	<1000	1000
1,2-dichloroethylene	<1000	1000	tetrachloroethylene	<1000	1000
chloroform	25000	1000	1,1,2,2-tetrachloroethane	<1000	1000
1,2-dichloroethane	<1000	1000	toluene	<1000	1000
1,1,1-trichloroethane	<1000	1000	chlorobenzene	43000	1000
carbon tetrachloride	<1000	1000	ethylbenzene	<1000	1000

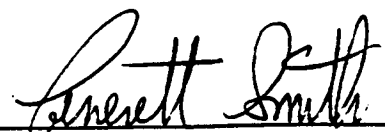
NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<6000	6000	vinyl acetate	<2000	2000
acetone	<2000	2000	4-methyl-2-pentanone	<2000	2000
carbon disulfide	<1000	1000	2-hexanone	<2000	2000
1,1,2-trichloro-			styrene	<1000	1000
1,2,2-trifluoroethane	<1000	1000	xylenes	<1000	1000
2-butanone	<2000	2000			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910809
Sample I.D.: MW-06-K1
Matrix: Water
Depth: —
Date Collected: 01/31/91
Time Collected: 1346
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<250	250	bromodichloromethane	<125	125
bromomethane	<250	250	1,2-dichloropropane	<125	125
vinyl chloride	<250	250	trans-1,3-dichloropropylene	<125	125
chloroethane	<250	250	trichloroethylene	240	125
methylene chloride	<125	125	benzene	<125	125
acrolein	<750	750	dibromochloromethane	<125	125
acrylonitrile	<250	250	cis-1,3-dichloropropylene	<125	125
trichlorofluoromethane	<125	125	1,1,2-trichloroethane	<125	125
1,1-dichloroethylene	<125	125	2-chloroethylvinyl ether	<125	125
1,1-dichloroethane	<125	125	bromoform	<125	125
1,2-dichloroethylene	<125	125	tetrachloroethylene	1600	125
chloroform	4700	125	1,1,2,2-tetrachloroethane	<125	125
1,2-dichloroethane	<125	125	toluene	<125	125
1,1,1-trichloroethane	<125	125	chlorobenzene	6500	125
carbon tetrachloride	450	125	ethylbenzene	<125	125

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	3100	750	vinyl acetate	<250	250
acetone	540	250	4-methyl-2-pentanone	360	250
carbon disulfide	<125	125	2-hexanone	<250	250
1,1,2-trichloro-			styrene	<125	125
1,2,2-trifluoroethane	<125	125	xylenes	<125	125
2-butanone	<250	250			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910810
Sample I.D.: MW-07-K1
Matrix: Water
Depth: ---
Date Collected: 01/31/91
Time Collected: 1520
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<500	500	bromodichloromethane	<250	250
bromomethane	<500	500	1,2-dichloropropane	<250	250
vinyl chloride	<500	500	trans-1,3-dichloropropylene	<250	250
chloroethane	<500	500	trichloroethylene	<250	250
methylene chloride	<250	250	benzene *	29000	250
acrolein	<1500	1500	dibromochloromethane	<250	250
acrylonitrile	<500	500	cis-1,3-dichloropropylene	<250	250
trichlorofluoromethane	<250	250	1,1,2-trichloroethane	<250	250
1,1-dichloroethylene	<250	250	2-chloroethylvinyl ether	<250	250
1,1-dichloroethane	<250	250	bromoform	<250	250
1,2-dichloroethylene	<250	250	tetrachloroethylene	<250	250
chloroform	1300	250	1,1,2,2-tetrachloroethane	<250	250
1,2-dichloroethane	4700	250	toluene *	39000	250
1,1,1-trichloroethane	<250	250	chlorobenzene	<250	250
carbon tetrachloride	<250	250	ethylbenzene	3600	250

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<1500	1500	vinyl acetate	<500	500
acetone	<500	500	4-methyl-2-pentanone	<500	500
carbon disulfide	<250	250	2-hexanone	<500	500
1,1,2-trichloro-			styrene	<250	250
1,2,2-trifluoroethane	<250	250	xlenes *	27000	250
2-butanone	<500	500			

Comments: Results reported in micrograms per liter.

* Above the highest level of calibration.

Analyst Darrell Cain, Bill Svoboda

Manager

Lenore Smith

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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/01/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910759
Sample I.D.: MW-08-K1
Matrix: Water
Depth: ---
Date Collected: 01/30/91
Time Collected: 1320
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/12/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	16	10	4-methyl-2-pentanone	21	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylenes	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910892
Sample I.D.: MW-09-K1
Matrix: Water
Depth: --
Date Collected: 02/01/91
Time Collected: 1600
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<5000	5000	bromodichloromethane	<2500	2500
bromomethane	<5000	5000	1,2-dichloropropane	<2500	2500
vinyl chloride	<5000	5000	trans-1,3-dichloropropylene	<2500	2500
chloroethane	<5000	5000	trichloroethylene	<2500	2500
methylene chloride	<2500	2500	benzene	<2500	2500
acrolein	<15000	15000	dibromochloromethane	<2500	2500
acrylonitrile	<5000	5000	cis-1,3-dichloropropylene	<2500	2500
trichlorofluoromethane	<2500	2500	1,1,2-trichloroethane	<2500	2500
1,1-dichloroethylene	<2500	2500	2-chloroethylvinyl ether	<2500	2500
1,1-dichloroethane	<2500	2500	bromoform	<2500	2500
1,2-dichloroethylene	<2500	2500	tetrachloroethylene	<2500	2500
chloroform	36000	2500	1,1,2,2-tetrachloroethane	<2500	2500
1,2-dichloroethane	<2500	2500	toluene	<2500	2500
1,1,1-trichloroethane	<2500	2500	chlorobenzene	77000	2500
carbon tetrachloride	<2500	2500	ethylbenzene	<2500	2500

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<15000	15000	vinyl acetate	<5000	5000
acetone	<5000	5000	4-methyl-2-pentanone	<5000	5000
carbon disulfide	<2500	2500	2-hexanone	<5000	5000
1,1,2-trichloro-			styrene	<2500	2500
1,2,2-trifluoroethane	<2500	2500	xylene	<2500	2500
2-butanone	<5000	5000			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/01/91
Reported	02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910761
Sample I.D.: MW-10-K1
Matrix: Water
Depth: ---
Date Collected: 01/30/91
Time Collected: 1505
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/13/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<50	50	bromodichloromethane	<25	25
bromomethane	<50	50	1,2-dichloropropane	<25	25
vinyl chloride	<50	50	trans-1,3-dichloropropylene	<25	25
chloroethane	<50	50	trichloroethylene	<25	25
methylene chloride	<25	25	benzene	<25	25
acrolein	<150	150	dibromochloromethane	<25	25
acrylonitrile	<50	50	cis-1,3-dichloropropylene	<25	25
trichlorofluoromethane	<25	25	1,1,2-trichloroethane	<25	25
1,1-dichloroethylene	<25	25	2-chloroethylvinyl ether	<25	25
1,1-dichloroethane	<25	25	bromoform	<25	25
1,2-dichloroethylene	<25	25	tetrachloroethylene	<25	25
chloroform	<25	25	1,1,2,2-tetrachloroethane	<25	25
1,2-dichloroethane	<25	25	toluene	<25	25
1,1,1-trichloroethane	<25	25	chlorobenzene	680	25
carbon tetrachloride	<25	25	ethylbenzene	<25	25

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<150	150	vinyl acetate	<50	50
acetone	<50	50	4-methyl-2-pentanone	<50	50
carbon disulfide	<25	25	2-hexanone	<50	50
1,1,2-trichloro-			styrene	<25	25
1,2,2-trifluoroethane	<25	25	xylenes	<25	25
2-butanone	<50	50			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910807
Sample I.D.: MW-11-K1
Matrix: Water
Depth: ---
Date Collected: 01/31/91
Time Collected: 1110
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<250	250	bromodichloromethane	<125	125
bromomethane	<250	250	1,2-dichloropropane	<125	125
vinyl chloride	<250	250	trans-1,3-dichloropropylene	<125	125
chloroethane	<250	250	trichloroethylene	<125	125
methylene chloride	<125	125	benzene	<125	125
acrolein	<750	750	dibromochloromethane	<125	125
acrylonitrile	<250	250	cis-1,3-dichloropropylene	<125	125
trichlorofluoromethane	<125	125	1,1,2-trichloroethane	<125	125
1,1-dichloroethylene	<125	125	2-chloroethylvinyl ether	<125	125
1,1-dichloroethane	<125	125	bromoform	<125	125
1,2-dichloroethylene	<125	125	tetrachloroethylene	220	125
chloroform	<125	125	1,1,2,2-tetrachloroethane	<125	125
1,2-dichloroethane	<125	125	toluene	<125	125
1,1,1-trichloroethane	<125	125	chlorobenzene	5500	125
carbon tetrachloride	<125	125	ethylbenzene	<125	125

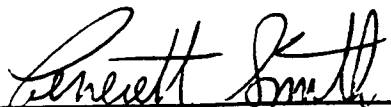
NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<750	750	vinyl acetate	<250	250
acetone	<250	250	4-methyl-2-pentanone	<250	250
carbon disulfide	<125	125	2-hexanone	<250	250
1,1,2-trichloro-			styrene	<125	125
1,2,2-trifluoroethane	<125	125	xylene	<125	125
2-butanone	<250	250			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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415-362-6065

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Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/01/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910762
Sample I.D.: MW-13-K1
Matrix: Water
Depth: —
Date Collected: 01/30/91
Time Collected: 1705
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/13/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<250	250	bromodichloromethane	<125	125
bromomethane	<250	250	1,2-dichloropropane	<125	125
vinyl chloride	<250	250	trans-1,3-dichloropropylene	<125	125
chloroethane	<250	250	trichloroethylene	540	125
methylene chloride	<125	125	benzene	22000	125
acrolein	<750	750	dibromochloromethane	<125	125
acrylonitrile	<250	250	cis-1,3-dichloropropylene	<125	125
trichlorofluoromethane	<125	125	1,1,2-trichloroethane	<125	125
1,1-dichloroethylene	<125	125	2-chloroethylvinyl ether	<125	125
1,1-dichloroethane	<125	125	bromoform	<125	125
1,2-dichloroethylene	<125	125	tetrachloroethylene	<125	125
chloroform	1500	125	1,1,2,2-tetrachloroethane	<125	125
1,2-dichloroethane	<125	125	toluene	13000	125
1,1,1-trichloroethane	<125	125	chlorobenzene	3100	125
carbon tetrachloride	<125	125	ethylbenzene	2400	125

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<750	750	vinyl acetate	<250	250
acetone	<250	250	4-methyl-2-pentanone	<250	250
carbon disulfide	<125	125	2-hexanone	<250	250
1,1,2-trichloro-			styrene	<125	125
1,2,2-trifluoroethane	<125	125	xylene	8500	125
2-butanone	<250	250			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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San Francisco, CA 94107
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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910805
Sample I.D.: MW-14-K1
Matrix: Water
Depth: —
Date Collected: 01/31/91
Time Collected: 0945
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<250	250	bromodichloromethane	<125	125
bromomethane	<250	250	1,2-dichloropropane	<125	125
vinyl chloride	<250	250	trans-1,3-dichloropropylene	<125	125
chloroethane	<250	250	trichloroethylene	<125	125
methylene chloride	<125	125	benzene	7600	125
acrolein	<750	750	dibromochloromethane	<125	125
acrylonitrile	<250	250	cis-1,3-dichloropropylene	<125	125
trichlorofluoromethane	<125	125	1,1,2-trichloroethane	<125	125
1,1-dichloroethylene	<125	125	2-chloroethylvinyl ether	<125	125
1,1-dichloroethane	<125	125	bromoform	<125	125
1,2-dichloroethylene	<125	125	tetrachloroethylene	<125	125
chloroform	<125	125	1,1,2,2-tetrachloroethane	<125	125
1,2-dichloroethane	600	125	toluene	<125	125
1,1,1-trichloroethane	<125	125	chlorobenzene	<125	125
carbon tetrachloride	<125	125	ethylbenzene	1300	125


NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<750	750	vinyl acetate	<250	250
acetone	<250	250	4-methyl-2-pentanone	<250	250
carbon disulfide	<125	125	2-hexanone	<250	250
1,1,2-trichloro-			styrene	<125	125
1,2,2-trifluoroethane	<125	125	xylene	650	125
2-butanone	<250	250			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/01/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910757
Sample I.D.: MW-18-K1
Matrix: Water
Depth: ---
Date Collected: 01/30/91
Time Collected: 1000
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/12/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene *	820	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	27	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	220	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xlenes	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

* Greater than highest level calibration.

Analyst Darrell Cain, Bill Svoboda

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/01/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910758
Sample I.D.: MW-19-K1
Matrix: Water
Depth: ---
Date Collected: 01/30/91
Time Collected: 1120
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/12/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	32	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	82	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



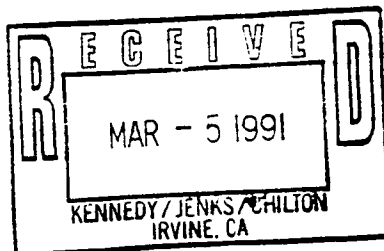
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APPENDIX D

Laboratory Reports para-Chlorobenzenesulfonic Acid

<u>Well No.</u>	<u>Sample I.D.</u>
MW-01	MW-01-K1
MW-02	MW-02-K1-AQ (Aqueous Fraction)
MW-02	MW-02-K1-NA (Non-Aqueous Fraction)
MW-03	MW-03-K1
MW-04	MW-04-K1
MW-05	MW-05-K1
MW-06	MW-06-K1
MW-07	MW-07-K1
MW-08	MW-08-K1
MW-09	MW-09-K1
MW-10	MW-10-K1
MW-11	MW-11-K1
MW-13	MW-13-K1
MW-14	MW-14-K1
MW-18	MW-18-K1
MW-19	MW-19-K1

February 27, 1991



WCAS
WEST COAST
ANALYTICAL
SERVICE, INC.
ANALYTICAL CHEMISTS

KENNEDY/JENKS/CHILTON
Laboratory Division
17310 Redhill Avenue
Suite 220
Irvine, CA 92714

Attn: Jim Lenoci

JOB NO. 17770

A

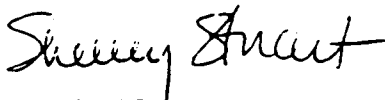
LABORATORY REPORT


Samples Received: Seven (7) liquid samples (one with two phases)
Date Received: 2-4-91
Purchase Order No: Proj#: 904020.00/DAC

The samples were analyzed as follows:

<u>Samples Analyzed</u>	<u>Analysis</u>	<u>Results</u>
Eight (8) liquids	p-Chlorobenzenesulfonic Acid by IC	Table 1
Three (3) liquids	p-Chlorobenzenesulfonic Acid by GCMS	Table 2

Page 1 of 2


Shelley Stuart
Senior Chemist


Michael Shelton
Technical Director

WEST COAST ANALYTICAL SERVICE, INC.

KENNEDY/JENKS/CHILTON
Mr. Jim Lenoci

Job # 17770
February 27, 1991

LABORATORY REPORT

TABLE 1

Parts Per Million (mg/L)

Sample ID p-Chlorobenzenesulfonic Acid by IC

FLD BLNK	ND
DUP2-K1	8.8
MW01-K1	14
MW02-K1-AQ	470
MW02-K1-NA	29
MW04-K1	9.3
MW05-K1	6.1
MW09-K1	32
Detection Limit	0.5

ND - Not Detected

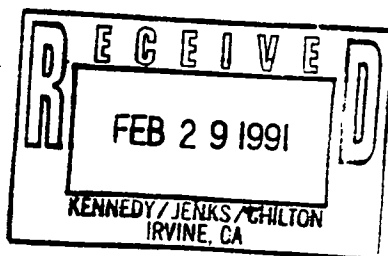
Date Analyzed: 2-5-91

TABLE 2

Sample ID p-Chlorobenzenesulfonic Acid by GCMS

MW01-K1	Confirmed
MW02-K1-AQ	Confirmed
MW09-K1	Confirmed

Date Analyzed: 2-22-91



WCAS
WEST COAST
ANALYTICAL
SERVICE, INC.

ANALYTICAL CHEMISTRY

February 27, 1991

KENNEDY/JENKS/CHILTON
Laboratory Division
17310 Redhill Avenue
Suite 220
Irvine, CA 92714

Attn: Jim Lenoci

JOB NO. 17752

A

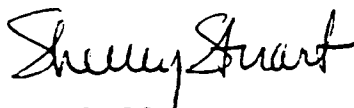
LABORATORY REPORT


Samples Received: Five (5) Water Samples
Date Received: 2-1-91
Purchase Order No: Proj#: 904020.00/DAC

The samples were analyzed as follows:

<u>Samples Analyzed</u>	<u>Analysis</u>	<u>Results</u>
Five (5) waters	p-Chlorobenzenesulfonic Acid by IC	Table 1
One (1) water	p-Chlorobenzenesulfonic Acid by GCMS	Table 2

Page 1 of 2


Shelley Stuart
Senior Chemist


Michael Shelton
Technical Director

WEST COAST ANALYTICAL SERVICE, INC.

KENNEDY/JENKS/CHILTON
Mr. Jim Lenoci

Job # 17752
February 27, 1991

LABORATORY REPORT

TABLE 1

Parts Per Million (mg/L)

Sample ID p-Chlorobenzenesulfonic Acid by IC

MW-03-K1	ND
MW06-K1	13
MW07-K1	3.7
MW11-K1	ND
MW14-K1	1.9
Detection Limit	0.5

ND - Not Detected

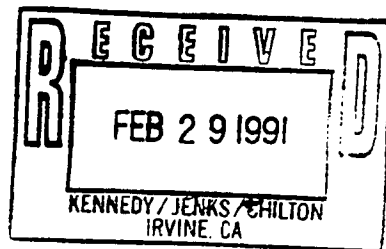
Date Analyzed: 2-5-91

TABLE 2

Sample ID p-Chlorobenzenesulfonic Acid by GCMS

MW06-K1 Confirmed

Date Analyzed: 2-22-91



WCAS
WEST COAST
ANALYTICAL
SERVICE, INC.

ANALYTICAL CHEMISTS

February 27, 1991

KENNEDY/JENKS/CHILTON
Laboratory Division
17310 Redhill Avenue
Suite 220
Irvine, CA 92714

Attn: Jim Lenoci

JOB NO. 17743

A

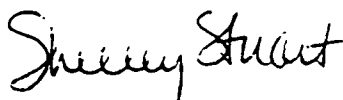
LABORATORY REPORT


Samples Received: Six (6) waters
Date Received: 1-31-91
Purchase Order No: Proj#: 904020.00/DAC

The samples were analyzed as follows:

<u>Samples Analyzed</u>	<u>Analysis</u>	<u>Results</u>
Six (6) waters	p-Chlorobenzenesulfonic Acid by IC	Table 1
One (1) water	p-Chlorobenzenesulfonic Acid by GCMS	Table 2

Page 1 of 2


Shelley Stuart
Senior Chemist


Michael Shelton
Technical Director

WEST COAST ANALYTICAL SERVICE, INC.

KENNEDY/JENKS/CHILTON
Mr. Jim Lenoci

Job # 17743
February 27, 1991

LABORATORY REPORT

TABLE 1

Parts Per Million (mg/L)

Sample ID p-Chlorobenzenesulfonic Acid by IC

DUP1-K1	ND
MW08-K1	ND
MW10-K1	ND
MW13-K1	4.8
MW18-K1	ND
MW19-K1	ND
Detection Limit	0.5

ND - Not Detected

Date Analyzed: 2-5-91

TABLE 2

Sample ID p-Chlorobenzenesulfonic Acid by GCMS

MW13-K1 Confirmed

Date Analyzed: 2-22-91

APPENDIX E

**Laboratory Reports
Inorganic Chemicals**

Well No.

Sample I.D.

MW-01
MW-03
MW-04
MW-05
MW-06
MW-07
MW-08
MW-09
MW-10
MW-11
MW-13
MW-14
MW-18
MW-19

MW-01-K1
MW-03-K1
MW-04-K1
MW-05-K1
MW-06-K1
MW-07-K1
MW-08-K1
MW-09-K1
MW-10-K1
MW-11-K1
MW-13-K1
MW-14-K1
MW-18-K1
MW-19-K1

LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910890
Sample I.D.:	MW-01-K1
Matrix:	Water
Depth:	---
Date Collected:	02/01/91
Time Collected:	1300
Collected by:	K/J/C
Date Extracted:	---
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.9	±0.1
Conductivity @ 25 °C	umhos/cm	4700	2
Total Dissolved			
Solids(180 °C)	mg/L	5200	2
Total Hardness(CaCO3)	mg/L	3100	1
Calcium(Ca)(1)	mg/L	810	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	260	0.1
Sodium(Na)(1)	mg/L	600	0.5
Potassium(K)(1)	mg/L	18	0.5
T. Alkalinity(CaCO3)	mg/L	550	2
Bicarbonate Alk.(HCO3)	mg/L	670	1
Chloride(Cl)	mg/L	2300	0.5
Sulfate(SO4)	mg/L	600	0.6
Nitrate Nitrogen(N)	mg/L	0.04	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91. Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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LABORATORY REPORT

PACIFIC ENVIRONMENTAL LABORATORY

674 Harrison Street
San Francisco, CA 94107
415-243-2580

For Kennedy/Jenks Consultants
Attention Jim Lenoci
Address 17310 Red Hill Ave., Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 03/18/91

(K/J 904020.00)

Source: D.A.C.
Lab. No.: 910890
Sample I.D.: MW-01-K1
Matrix: Water
Depth: --
Date Collected: 02/01/91
Time Collected: 1300
Collected by: K/J
Date Extracted: --
Date Analyzed: 03/15/91
Analytical Method: Standard Method 205

Analysis	Units	Analytical Results	Det. Lim.
Conductivity @ 25°C	umhos/cm	6500 *	2

Comments: "umhos/cm" means "micromhos per centimeter".

* Re-run value.

Analyst Polly Cheung

Manager 

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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910811
Sample I.D.:	MW-03-K1
Matrix:	Water
Depth:	--
Date Collected:	01/31/91
Time Collected:	1710
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.9	±0.1
Conductivity @ 25 °C	umhos/cm	1200	2
Total Dissolved			
Solids(180 °C)	mg/L	710	2
Total Hardness(CaCO3)	mg/L	500	1
Calcium(Ca)(1)	mg/L	140	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	39	0.1
Sodium(Na)(1)	mg/L	81	0.5
Potassium(K)(1)	mg/L	4.5	0.5
T. Alkalinity(CaCO3)	mg/L	430	2
Bicarbonate Alk.(HCO3)	mg/L	520	1
Chloride(Cl)	mg/L	180	0.5
Sulfate(SO4)	mg/L	41	0.6
Nitrate Nitrogen(N)	mg/L	0.04	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

(K/J/C 904020.00)

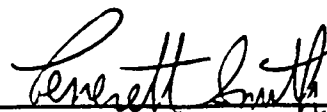
Source:	D.A.C.
Lab. No.:	910886
Sample I.D.:	MW-04-K1
Matrix:	Water
Depth:	---
Date Collected:	02/01/91
Time Collected:	1015
Collected by:	KJJ/C
Date Extracted:	---
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.7	±0.1
Conductivity @ 25 °C	umhos/cm	1900	2
Total Dissolved			
Solids(180 °C)	mg/L	1500	2
Total Hardness(CaCO3)	mg/L	960	1
Calcium(Ca)(1)	mg/L	270	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	67	0.1
Sodium(Na)(1)	mg/L	120	0.5
Potassium(K)(1)	mg/L	11	0.5
T. Alkalinity(CaCO3)	mg/L	480	2
Bicarbonate Alk.(HCO3)	mg/L	590	1
Chloride(Cl)	mg/L	400	0.5
Sulfate(SO4)	mg/L	240	0.6
Nitrate Nitrogen(N)	mg/L	8.0	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910888
Sample I.D.:	MW-05-K1
Matrix:	Water
Depth:	--
Date Collected:	02/01/91
Time Collected:	1150
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.8	±0.1
Conductivity @ 25 °C	umhos/cm	2500	2
Total Dissolved Solids(180 °C)	mg/L	2000	2
Total Hardness(CaCO3)	mg/L	1300	1
Calcium(Ca)(1)	mg/L	370	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	91	0.1
Sodium(Na)(1)	mg/L	130	0.5
Potassium(K)(1)	mg/L	12	0.5
T. Alkalinity(CaCO3)	mg/L	620	2
Bicarbonate Alk.(HCO3)	mg/L	760	1
Chloride(Cl)	mg/L	670	0.5
Sulfate(SO4)	mg/L	150	0.6
Nitrate Nitrogen(N)	mg/L	1.5	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91. Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

(K/J/C 904020.00)

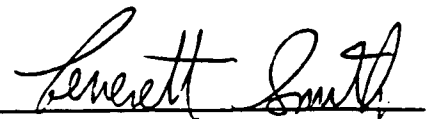
Source:	D.A.C.
Lab. No.:	910809
Sample I.D.:	MW-06-K1
Matrix:	Water
Depth:	--
Date Collected:	01/31/91
Time Collected:	1346
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.8	±0.1
Conductivity @ 25 °C	umhos/cm	5800	2
Total Dissolved Solids(180 °C)	mg/L	5800	2
Total Hardness(CaCO3)	mg/L	3900	1
Calcium(Ca)(1)	mg/L	1100	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	290	0.1
Sodium(Na)(1)	mg/L	390	0.5
Potassium(K)(1)	mg/L	22	0.5
T. Alkalinity(CaCO3)	mg/L	520	2
Bicarbonate Alk.(HCO3)	mg/L	630	1
Chloride(Cl)	mg/L	1800	0.5
Sulfate(SO4)	mg/L	1900	0.6
Nitrate Nitrogen(N)	mg/L	16	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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LABORATORY REPORT**PACIFIC ENVIRONMENTAL LABORATORY**

674 Harrison Street
San Francisco, CA 94107
415-243-2580

For Kennedy/Jenks Consultants
Attention Jim Lenoci
Address 17310 Red Hill Ave., Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 03/18/91

(K/J 904020.00)

Source: D.A.C.
Lab. No.: 910809
Sample I.D.: MW-06-K1
Matrix: Water
Depth: --
Date Collected: 01/31/91
Time Collected: 1346
Collected by: K/J
Date Extracted: --
Date Analyzed: 03/15/91
Analytical Method: Standard Method 205

Analysis	Units	Analytical Results	Det. Lim.
Conductivity @ 25°C	umhos/cm	6100 *	2

Comments: "umhos/cm" means "micromhos per centimeter".
* Re-run value.

Analyst Polly Cheung

Manager 

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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910810
Sample I.D.:	MW-07-K1
Matrix:	Water
Depth:	---
Date Collected:	01/31/91
Time Collected:	1520
Collected by:	K/J/C
Date Extracted:	---
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.8	±0.1
Conductivity @ 25 °C	umhos/cm	2800	2
Total Dissolved Solids(180 °C)	mg/L	2500	2
Total Hardness(CaCO3)	mg/L	1700	1
Calcium(Ca)(1)	mg/L	450	0.1
Iron(Fe)(1)	mg/L	0.070	0.01
Magnesium(Mg)(1)	mg/L	150	0.1
Sodium(Na)(1)	mg/L	190	0.5
Potassium(K)(1)	mg/L	6.4	0.5
T. Alkalinity(CaCO3)	mg/L	430	2
Bicarbonate Alk.(HCO3)	mg/L	520	1
Chloride(Cl)	mg/L	780	0.5
Sulfate(SO4)	mg/L	460	0.6
Nitrate Nitrogen(N)	mg/L	0.21	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91. Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/01/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910759
Sample I.D.:	MW-08-K1
Matrix:	Water
Depth:	--
Date Collected:	01/30/91
Time Collected:	1320
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.9	±0.1
Conductivity @ 25 °C	umhos/cm	920	2
Total Dissolved			
Solids(180 °C)	mg/L	590	2
Total Hardness(CaCO3)	mg/L	330	1
Calcium(Ca)(1)	mg/L	86	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	27	0.1
Sodium(Na)(1)	mg/L	90	0.5
Potassium(K)(1)	mg/L	8.0	0.5
T. Alkalinity(CaCO3)	mg/L	200	2
Bicarbonate Alk.(HCO3)	mg/L	240	1
Chloride(Cl)	mg/L	220	0.5
Sulfate(SO4)	mg/L	26	0.6
Nitrate Nitrogen(N)	mg/L	1.9	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910892
Sample I.D.:	MW-09-K1
Matrix:	Water
Depth:	--
Date Collected:	02/01/91
Time Collected:	1600
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	7.1	±0.1
Conductivity @ 25 °C	umhos/cm	2300	2
Total Dissolved Solids(180 °C)	mg/L	1700	2
Total Hardness(CaCO3)	mg/L	1200	1
Calcium(Ca)(1)	mg/L	330	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	82	0.1
Sodium(Na)(1)	mg/L	120	0.5
Potassium(K)(1)	mg/L	13	0.5
T. Alkalinity(CaCO3)	mg/L	460	2
Bicarbonate Alk.(HCO3)	mg/L	560	1
Chloride(Cl)	mg/L	420	0.5
Sulfate(SO4)	mg/L	310	0.6
Nitrate Nitrogen(N)	mg/L	0.54	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
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Irvine, CA 92714

Received	02/01/91
Reported	02/27/91

(K/J/C 904020.00)


Source:	D.A.C.
Lab. No.:	910761
Sample I.D.:	MW-10-K1
Matrix:	Water
Depth:	---
Date Collected:	01/30/91
Time Collected:	1505
Collected by:	K/J/C
Date Extracted:	---
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.8	±0.1
Conductivity @ 25 °C	umhos/cm	2000	2
Total Dissolved Solids(180 °C)	mg/L	1500	2
Total Hardness(CaCO3)	mg/L	930	1
Calcium(Ca)(1)	mg/L	270	0.1
Iron(Fe)(1)	mg/L	<0.01	0.05
Magnesium(Mg)(1)	mg/L	61	0.1
Sodium(Na)(1)	mg/L	140	0.5
Potassium(K)(1)	mg/L	12	0.5
T. Alkalinity(CaCO3)	mg/L	330	2
Bicarbonate Alk.(HCO3)	mg/L	400	1
Chloride(Cl)	mg/L	590	0.5
Sulfate(SO4)	mg/L	75	0.6
Nitrate Nitrogen(N)	mg/L	11	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910807
Sample I.D.:	MW-11-K1
Matrix:	Water
Depth:	---
Date Collected:	01/31/91
Time Collected:	1110
Collected by:	K/J/C
Date Extracted:	---
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.9	±0.1
Conductivity @ 25 °C	umhos/cm	2000	2
Total Dissolved Solids(180 °C)	mg/L	1700	2
Total Hardness(CaCO3)	mg/L	1100	1
Calcium(Ca)(1)	mg/L	290	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	94	0.1
Sodium(Na)(1)	mg/L	160	0.5
Potassium(K)(1)	mg/L	12	0.5
T. Alkalinity(CaCO3)	mg/L	750	2
Bicarbonate Alk.(HCO3)	mg/L	920	1
Chloride(Cl)	mg/L	370	0.5
Sulfate(SO4)	mg/L	270	0.6
Nitrate Nitrogen(N)	mg/L	0.04	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/01/91
Reported	02/27/91

(K/J/C 904020.00)

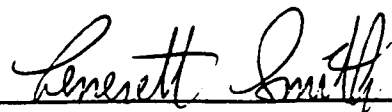
Source:	D.A.C.
Lab. No.:	910762
Sample I.D.:	MW-13-K1
Matrix:	Water
Depth:	---
Date Collected:	01/30/91
Time Collected:	1705
Collected by:	K/J/C
Date Extracted:	---
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.8	±0.1
Conductivity @ 25 °C	umhos/cm	2300	2
Total Dissolved Solids(180 °C)	mg/L	1800	2
Total Hardness(CaCO3)	mg/L	1100	1
Calcium(Ca)(1)	mg/L	274	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	100	0.1
Sodium(Na)(1)	mg/L	210	0.5
Potassium(K)(1)	mg/L	7.4	0.5
T. Alkalinity(CaCO3)	mg/L	450	2
Bicarbonate Alk.(HCO3)	mg/L	550	1
Chloride(Cl)	mg/L	620	0.5
Sulfate(SO4)	mg/L	180	0.6
Nitrate Nitrogen(N)	mg/L	0.13	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

(K/J/C 904020.00)

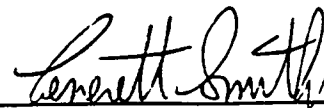
Source:	D.A.C.
Lab. No.:	910805
Sample I.D.:	MW-14-K1
Matrix:	Water
Depth:	--
Date Collected:	01/31/91
Time Collected:	0945
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.9	±0.1
Conductivity @ 25 °C	umhos/cm	1900	2
Total Dissolved Solids(180 °C)	mg/L	1300	2
Total Hardness(CaCO3)	mg/L	810	1
Calcium(Ca)(1)	mg/L	190	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	77	0.1
Sodium(Na)(1)	mg/L	390	0.5
Potassium(K)(1)	mg/L	6.4	0.5
T. Alkalinity(CaCO3)	mg/L	760	2
Bicarbonate Alk.(HCO3)	mg/L	930	1
Chloride(Cl)	mg/L	350	0.5
Sulfate(SO4)	mg/L	31	0.6
Nitrate Nitrogen(N)	mg/L	0.07	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/01/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910757
Sample I.D.:	MW-18-K1
Matrix:	Water
Depth:	--
Date Collected:	01/30/91
Time Collected:	1000
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.7	±0.1
Conductivity @ 25 °C	umhos/cm	640	2
Total Dissolved Solids(180 °C)	mg/L	400	2
Total Hardness(CaCO3)	mg/L	200	1
Calcium(Ca)(1)	mg/L	58	0.1
Iron(Fe)(1)	mg/L	0.028	0.01
Magnesium(Mg)(1)	mg/L	14	0.1
Sodium(Na)(1)	mg/L	56	0.5
Potassium(K)(1)	mg/L	5.7	0.5
T. Alkalinity(CaCO3)	mg/L	200	2
Bicarbonate Alk.(HCO3)	mg/L	250	1
Chloride(Cl)	mg/L	66	0.5
Sulfate(SO4)	mg/L	36	0.6
Nitrate Nitrogen(N)	mg/L	1.6	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/01/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910758
Sample I.D.:	MW-19-K1
Matrix:	Water
Depth:	---
Date Collected:	01/30/91
Time Collected:	1120
Collected by:	K/J/C
Date Extracted:	---
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.8	±0.1
Conductivity @ 25 °C	umhos/cm	1100	2
Total Dissolved Solids(180 °C)	mg/L	800	2
Total Hardness(CaCO3)	mg/L	400	1
Calcium(Ca)(1)	mg/L	120	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	23	0.1
Sodium(Na)(1)	mg/L	82	0.5
Potassium(K)(1)	mg/L	9.4	0.5
T. Alkalinity(CaCO3)	mg/L	170	2
Bicarbonate Alk.(HCO3)	mg/L	200	1
Chloride(Cl)	mg/L	280	0.5
Sulfate(SO4)	mg/L	29	0.6
Nitrate Nitrogen(N)	mg/L	2.9	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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APPENDIX F

Laboratory Reports Aqueous and DNAPL Samples from MW-02

- Volatile Organic Compounds
- Inorganic Chemicals
- Specific Gravity (Density)
- Total Organic Carbon (TOC)

Well No.

MW-02
MW-02

Sample I.D.

MW-02-K1 (Aqueous Fraction)
MW-02-K1 (Non-Aqueous Fraction)

LABORATORY REPORT

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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	03/11/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910891
Sample I.D.: MW-02-K1
Matrix: Liquid *
Depth: --
Date Collected: 02/01/91
Time Collected: 1345
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/20/91 and 03/06/91
EPA Analytical Method: 8010

Analysis	Units	Analytical Results	Det. Lim.
chloromethane	ug/L	<500000	500000
bromomethane	ug/L	<500000	500000
vinyl chloride	ug/L	<500000	500000
chloroethane	ug/L	<500000	500000
methylene chloride	ug/L	<500000	500000
trichlorofluoromethane	ug/L	<500000	500000
1,1-dichloroethylene	ug/L	<500000	500000
1,1-dichloroethane	ug/L	<500000	500000
1,2-dichloroethylene	ug/L	<500000	500000
chloroform	ug/L	800000	500000
1,1,2-trichloro-			
1,2,2-trifluoroethane	ug/L	<500000	500000
1,2-dichloroethane	ug/L	<500000	500000
1,1,1-trichloroethane	ug/L	<500000	500000
carbon tetrachloride	ug/L	<500000	500000
bromodichloromethane	ug/L	<500000	500000
1,2-dichloropropane	ug/L	<500000	500000
cis-1,3-dichloropropylene	ug/L	<500000	500000
trichloroethylene	ug/L	<500000	500000
1,1,2-trichloroethane	ug/L	<500000	500000
chlorodibromomethane	ug/L	<500000	500000
trans-1,3-dichloropropylene	ug/L	<500000	500000
2-chloroethylvinyl ether **	ug/L	<500000	500000
bromoform	ug/L	<500000	500000
tetrachloroethylene	ug/L	<500000	500000
1,1,2,2-tetrachloroethane	ug/L	<500000	500000
chlorobenzene	ug/L	440000000	500000

Comments: Results reported in micrograms per liter. ** Unstable compound.

* Non-aqueous fraction of the sample. This is an average of two separate analyses.

Analyst Kevin Draper, Tina Mah

Manager 

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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 303 Second Street, Tenth Floor North
San Francisco, CA 94107

Received	02/05/91
Reported	02/27/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910891
Sample I.D.: MW-02-K1
Matrix: Liquid *
Depth: —
Date Collected: 02/01/91
Time Collected: 1345
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/20/91
EPA Analytical Method: 8010

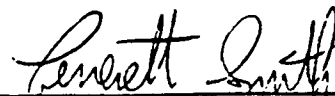
Analysis	Units	Analytical Results	Det. Lim.
chloromethane	ug/L	<500000	500000
bromomethane	ug/L	<500000	500000
vinyl chloride	ug/L	<500000	500000
chloroethane	ug/L	<500000	500000
methylene chloride	ug/L	<500000	500000
trichlorofluoromethane	ug/L	<500000	500000
1,1-dichloroethylene	ug/L	<500000	500000
1,1-dichloroethane	ug/L	<500000	500000
1,2-dichloroethylene	ug/L	<500000	500000
chloroform	ug/L	700000	500000
1,1,2-trichloro-			
1,2,2-trifluoroethane	ug/L	<500000	500000
1,2-dichloroethane	ug/L	<500000	500000
1,1,1-trichloroethane	ug/L	<500000	500000
carbon tetrachloride	ug/L	<500000	500000
bromodichloromethane	ug/L	<500000	500000
1,2-dichloropropane	ug/L	<500000	500000
cis-1,3-dichloropropylene	ug/L	<500000	500000
trichloroethylene	ug/L	<500000	500000
1,1,2-trichloroethane	ug/L	<500000	500000
chlorodibromomethane	ug/L	<500000	500000
trans-1,3-dichloropropylene	ug/L	<500000	500000
2-chloroethylvinyl ether **	ug/L	<500000	500000
bromoform	ug/L	<500000	500000
tetrachloroethylene	ug/L	<500000	500000
1,1,2,2-tetrachloroethane	ug/L	<500000	500000
chlorobenzene	ug/L	380000000	500000

Comments: Results reported in micrograms per liter. ** Unstable compound.

* Non-aqueous fraction of the sample.

Analyst Kevin Draper, Tina Mah

Manager



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Kennedy/Jenks/Chilton, Laboratory Division

303 Second Street, Tenth Floor North

San Francisco, CA 94107

415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	03/11/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910891
Sample I.D.: MW-02-K1
Matrix: Liquid *
Depth: --
Date Collected: 02/01/91
Time Collected: 1345
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 03/06/91
EPA Analytical Method: 8010

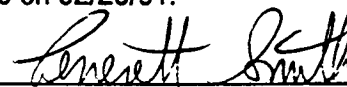
Analysis	Units	Analytical Results	Det. Lim.
chloromethane	ug/L	<500000	500000
bromomethane	ug/L	<500000	500000
vinyl chloride	ug/L	<500000	500000
chloroethane	ug/L	<500000	500000
methylene chloride	ug/L	<500000	500000
trichlorofluoromethane	ug/L	<500000	500000
1,1-dichloroethylene	ug/L	<500000	500000
1,1-dichloroethane	ug/L	<500000	500000
1,2-dichloroethylene	ug/L	<500000	500000
chloroform	ug/L	900000	500000
1,1,2-trichloro-			
1,2,2-trifluoroethane	ug/L	<500000	500000
1,2-dichloroethane	ug/L	<500000	500000
1,1,1-trichloroethane	ug/L	<500000	500000
carbon tetrachloride	ug/L	<500000	500000
bromodichloromethane	ug/L	<500000	500000
1,2-dichloropropane	ug/L	<500000	500000
cis-1,3-dichloropropylene	ug/L	<500000	500000
trichloroethylene	ug/L	<500000	500000
1,1,2-trichloroethane	ug/L	<500000	500000
chlorodibromomethane	ug/L	<500000	500000
trans-1,3-dichloropropylene	ug/L	<500000	500000
2-chloroethylvinyl ether **	ug/L	<500000	500000
bromoform	ug/L	<500000	500000
tetrachloroethylene	ug/L	<500000	500000
1,1,2,2-tetrachloroethane	ug/L	<500000	500000
chlorobenzene	ug/L	500000000	500000

Comments: Results reported in micrograms per liter. ** Unstable compound.

* Non-aqueous fraction of the sample. Sample previously analyzed by 8010 on 02/20/91.

Analyst Kevin Draper, Tina Mah

Manager



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Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received —
Reported 02/27/91
Quality Control Page
(K/J/C 904020.00)

Source: —
Lab. No.: Method Blank
Sample I.D.: Methanol Used for Sample Preparation
Matrix: Aqueous
Depth: —
Date Collected: —
Time Collected: —
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 03/06/91
EPA Analytical Method: 8010

Analysis	Units	Analytical Results	Det. Lim.
chloromethane	ug/L	<50	50
bromomethane	ug/L	<50	50
vinyl chloride	ug/L	<50	50
chloroethane	ug/L	<50	50
methylene chloride	ug/L	<50	50
trichlorofluoromethane	ug/L	<50	50
1,1-dichloroethylene	ug/L	<50	50
1,1-dichloroethane	ug/L	<50	50
1,2-dichloroethylene	ug/L	<50	50
chloroform	ug/L	<50	50
1,1,2-trichloro-			
1,2,2-trifluoroethane	ug/L	<50	50
1,2-dichloroethane	ug/L	<50	50
1,1,1-trichloroethane	ug/L	<50	50
carbon tetrachloride	ug/L	<50	50
bromodichloromethane	ug/L	<50	50
1,2-dichloropropane	ug/L	<50	50
cis-1,3-dichloropropylene	ug/L	<50	50
trichloroethylene	ug/L	<50	50
1,1,2-trichloroethane	ug/L	<50	50
chlorodibromomethane	ug/L	<50	50
trans-1,3-dichloropropylene	ug/L	<50	50
2-chloroethylvinyl ether **	ug/L	<50	50
bromoform	ug/L	<50	50
tetrachloroethylene	ug/L	<50	50
1,1,2,2-tetrachloroethane	ug/L	<50	50
chlorobenzene	ug/L	<50	50

Comments: Results reported in micrograms per liter. ** Unstable compound.

* Non-aqueous fraction of the sample.

Analyst Kevin Draper, Tina Mah

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910891 Non-Aqueous Layer
Sample I.D.: MW-02-K1
Matrix: Liquid
Depth: --
Date Collected: 02/01/91
Time Collected: 1345
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/15/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10,000,000	10,000,000	bromodichloromethane	<5,000,000	5,000,000
bromomethane	<10,000,000	10,000,000	1,2-dichloropropane	<5,000,000	5,000,000
vinyl chloride	<10,000,000	10,000,000	trans-1,3-dichloropropylene	<5,000,000	5,000,000
chloroethane	<10,000,000	10,000,000	trichloroethylene	<5,000,000	5,000,000
methylene chloride	<5,000,000	5,000,000	benzene	<5,000,000	5,000,000
acrolein	<30,000,000	30,000,000	dibromochloromethane	<5,000,000	5,000,000
acrylonitrile	<10,000,000	10,000,000	cis-1,3-dichloropropylene	<5,000,000	5,000,000
trichlorofluoromethane	<5,000,000	5,000,000	1,1,2-trichloroethane	<5,000,000	5,000,000
1,1-dichloroethylene	<5,000,000	5,000,000	2-chloroethylvinyl ether	<5,000,000	5,000,000
1,1-dichloroethane	<5,000,000	5,000,000	bromoform	<5,000,000	5,000,000
1,2-dichloroethylene	<5,000,000	5,000,000	tetrachloroethylene	<5,000,000	5,000,000
chloroform *	<5,000,000	5,000,000	1,1,2,2-tetrachloroethane	<5,000,000	5,000,000
1,2-dichloroethane	<5,000,000	5,000,000	toluene	<5,000,000	5,000,000
1,1,1-trichloroethane	<5,000,000	5,000,000	chlorobenzene	670,000,000	5,000,000
carbon tetrachloride	<5,000,000	5,000,000	ethylbenzene	<5,000,000	5,000,000

NON-PRIORITY POLLUTANT COMPOUNDS

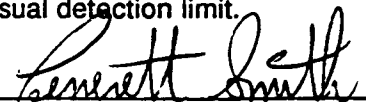
acetonitrile	<30,000,000	30,000,000	vinyl acetate	<10,000,000	10,000,00
acetone	<10,000,000	10,000,000	4-methyl-2-pentanone	<10,000,000	10,000,00
carbon disulfide	<5,000,000	5,000,000	2-hexanone	<10,000,000	10,000,00
1,1,2-trichloro-			styrene	<5,000,000	5,000,000
1,2,2-trifluoroethane	<5,000,000	5,000,000	xylene	<5,000,000	5,000,000
2-butanone	<10,000,000	10,000,000			

Comments: Results reported in micrograms per liter.

* Trace level identified by retention time and mass spectrum, but far below usual detection limit.

Analyst Darrell Cain, Bill Svoboda

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910891 Aqueous
Sample I.D.: MW-02-K1
Matrix: Water
Depth: —
Date Collected: 02/01/91
Time Collected: 1345
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/15/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10000	10000	bromodichloromethane	<5000	5000
bromomethane	<10000	10000	1,2-dichloropropane	<5000	5000
vinyl chloride	<10000	10000	trans-1,3-dichloropropylene	<5000	5000
chloroethane	<10000	10000	trichloroethylene	<5000	5000
methylene chloride	<5000	5000	benzene	<5000	5000
acrolein	<30000	30000	dibromochloromethane	<5000	5000
acrylonitrile	<10000	10000	cis-1,3-dichloropropylene	<5000	5000
trichlorofluoromethane	<5000	5000	1,1,2-trichloroethane	<5000	5000
1,1-dichloroethylene	<5000	5000	2-chloroethylvinyl ether	<5000	5000
1,1-dichloroethane	<5000	5000	bromoform	<5000	5000
1,2-dichloroethylene	<5000	5000	tetrachloroethylene	<5000	5000
chloroform	5300	5000	1,1,2,2-tetrachloroethane	<5000	5000
1,2-dichloroethane	<5000	5000	toluene	<5000	5000
1,1,1-trichloroethane	<5000	5000	chlorobenzene *	250000	5000
carbon tetrachloride	<5000	5000	ethylbenzene	<5000	5000

NON-PRIORITY POLLUTANT COMPOUNDS

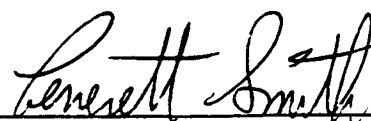
acetonitrile	<30000	30000	vinyl acetate	<10000	10000
acetone	<10000	10000	4-methyl-2-pentanone	<10000	10000
carbon disulfide	<5000	5000	2-hexanone	<10000	10000
1,1,2-trichloro-			styrene	<5000	5000
1,2,2-trifluoroethane	<5000	5000	xylene	<5000	5000
2-butanone	<10000	10000			

Comments: Results reported in micrograms per liter.

* Above the highest level of calibration.

Analyst Darrell Cain, Bill Svoboda

Manager



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Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/27/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910891
Sample I.D.: MW-02-K1
Matrix: Water *
Depth: --
Date Collected: 02/01/91
Time Collected: 1345
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/07-22/91
Analytical Method: --

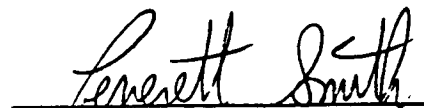
Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.4	±0.1
Conductivity @ 25 °C	umhos/cm	11000	2
Total Dissolved			
Solids(180 °C)	mg/L	15000	2
Total Hardness(CaCO3)	mg/L	4100	1
Calcium(Ca)(1)	mg/L	520	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	670	0.1
Sodium(Na)(1)	mg/L	2300	0.5
Potassium(K)(1)	mg/L	18	0.5
T. Alkalinity(CaCO3)	mg/L	420	2
Bicarbonate Alk.(HCO3)	mg/L	510	1
Chloride(Cl)	mg/L	2200	0.5
Sulfate(SO4)	mg/L	6400	0.6
Nitrate Nitrogen(N)	mg/L	0.62	0.02

* Aqueous fraction of the sample.

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

(KJJ/C 904020.00)

Source:	D.A.C.
Lab. No.:	910891
Sample I.D.:	MW-02-K1
Matrix:	Oil *
Depth:	--
Date Collected:	02/01/91
Time Collected:	1345
Collected by:	KJJ/C
Date Extracted:	--
Date Analyzed:	02/11/91
EPA Analytical Method:	

Analysis	Units	Analytical Results	Det. Lim.
Density	gm/mL	1.22	--

* Non-aqueous fraction of the sample.

Comments: Results reported in grams per milliliter.

Analyst Polly Cheung

Manager Lenorett Smith

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3700 Lakeville Highway, Petaluma, CA 94954
P.O. Box 808024, Petaluma, CA 94975-8024
Telephone: (707) 763-8245 FAX: (707) 763-4065

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FEB 20 1991

KENNEDY/JENKS/CHILTON
LABORATORY DIVISION

Ted Nakamura
Kennedy/Jenks/Chilton, Lab. Division
674 Harrison St.
San Francisco, CA 94107

Client Code: KJEN3

Page 1

L A B O R A T O R Y R E S U L T S

Date Collected: 02/01/91
Date Analyzed: 02/18/91

Laboratory Job No.: 910762
Date Received: 02/12/91
Date Reported: 02/19/91

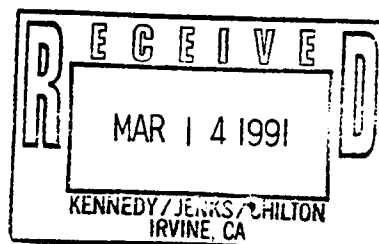
ASSAY:
TOTAL ORGANIC CARBON (EPA 9060)

MATRIX:WATER

LABNO	SMPLNO	COMPOUND	FOUND mg/L	DET.LIM. mg/L
5511	910891-AQUEOUS	TOC	1,320	40
5512	CM	TOC	ND	4
5513	CMS	TOC	41.7	4
5514	CMSD	TOC	42.2	4
5515	MB	TOC	ND	4

NOTE: CMS AND CMSD WERE SPIKED AT 40 mg/L.

NOTE: THE NON-AQUEOUS LAYER COULD NOT BE ANALYZED FOR TOC DUE TO
THE EXTREMELY HIGH CONTENT OF ORGANICS.



THIS REPORT HAS BEEN REVIEWED
AND APPROVED FOR RELEASE.

DUF



3700 Lakeville Highway, Petaluma, CA 94954
P.O. Box 808024, Petaluma, CA 94975-8024
Telephone: (707) 763-8245 FAX: (707) 763-4065

QUALITY CONTROL REPORT - UPDATE

For the past few months, ACCULAB Environmental Services' has been reporting the results of Quality Control sample analysis along with your sample results. This has been done to provide you with the means of assessing the quality of the data in our report. In order to improve your ability to make this assessment, we will also be providing the results of the method blank (MB) that was run with your samples.

Method blanks are designed to monitor the level of contamination introduced by reagents, extracting solvents, glassware, etc. They are prepared and processed in exactly the same manner as samples and spikes, except that no standard is spiked into them.

We are also changing the name of the unspiked control matrix sample from Control Matrix Blank (CMB) to Control Matrix (CM) to more accurately describe the nature of the sample.

Due to the nature of the control matrix materials, certain positive values can be expected in the control matrix (CM) results. The tap water we use for liquids may contain trihalomethanes, anions, major cations, and some trace metals. The control matrix we use for solids may also contain anions, major cations and some trace metals. These positive results represent inherent concentrations and in no way reflect upon your sample results, or upon laboratory background levels.

We continue to strive to improve the quality of service to our clients. We welcome any questions or comments you may have about this information, or about ACCULAB in general. Please contact a Project Manager for further information.

APPENDIX G

**Laboratory Reports
Quality Assurance/Quality Control (QA/QC) Reports**

Summary of IC QA/QC Results

Sample ID: MW10-K1

<u>Sample Result</u>	<u>Duplicate Result</u>	<u>RPD</u>	<u>MS Result</u>	<u>% Rec</u>	<u>MSD Result</u>	<u>% Rec</u>	<u>RPD</u>
ND	ND	---	11.1	111	10.7	107	3.7

Spike Level: 10 ppm

All results in milligrams/liter (ppm)

LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/01/91
Reported	02/27/91

(K/J/C 904020.00)

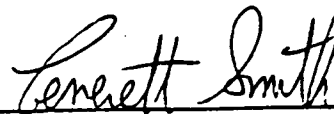
Source:	D.A.C.
Lab. No.:	910760
Sample I.D.:	Dup. 1-K1
Matrix:	Water
Depth:	--
Date Collected:	01/30/91
Time Collected:	1330
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	---

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	7.1	±0.1
Conductivity @ 25 °C	umhos/cm	1000	2
Total Dissolved			
Solids(180 °C)	mg/L	620	2
Total Hardness(CaCO3)	mg/L	340	1
Calcium(Ca)(1)	mg/L	88	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	28	0.1
Sodium(Na)(1)	mg/L	91	0.5
Potassium(K)(1)	mg/L	7.9	0.5
T. Alkalinity(CaCO3)	mg/L	190	2
Bicarbonate Alk.(HCO3)	mg/L	240	1
Chloride(Cl)	mg/L	220	0.5
Sulfate(SO4)	mg/L	26	0.6
Nitrate Nitrogen(N)	mg/L	1.7	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/01/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910760
Sample I.D.: Dup. 1-K1
Matrix: Water
Depth: —
Date Collected: 01/30/91
Time Collected: 1330
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/12/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

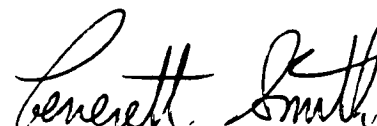
NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/01/91
Reported	02/27/91

Quality Control Page
(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910760
Sample I.D.:	Dup. 1-K1
Matrix:	Water
Depth:	--
Date Collected:	01/30/91
Time Collected:	1330
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/18-22/91
Analytical Method:	--

Analysis	Units	Replicate	Analytical Results	Det. Lim.
Total Hardness(CaCO3)	mg/L	340	340	Spike Recovery 88% 1
Calcium(Ca)(1)	mg/L	88.2	88.0	Spike Recovery 90% 0.1
Iron(Fe)(1)	mg/L	<0.01	0.0103	Spike Recovery 108% 0.05
Magnesium(Mg)(1)	mg/L	27.9	28.0	Spike Recovery 85% 0.1
Sodium(Na)(1)	mg/L	91.6	91.3	Spike Recovery 63% 0.5
Potassium(K)(1)	mg/L	7.98	7.78	Spike Recovery 92% 0.5

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L).

Analyst T. Kirkpatrick, T. DeLeon

Manager 

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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910889
Sample I.D.: Dup. 2-K1
Matrix: Water
Depth: —
Date Collected: 02/01/91
Time Collected: 1145
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<2000	2000	bromodichloromethane	<1000	1000
bromomethane	<2000	2000	1,2-dichloropropane	<1000	1000
vinyl chloride	<2000	2000	trans-1,3-dichloropropylene	<1000	1000
chloroethane	<2000	2000	trichloroethylene	<1000	1000
methylene chloride	<1000	1000	benzene	<1000	1000
acrolein	<6000	6000	dibromochloromethane	<1000	1000
acrylonitrile	<2000	2000	cis-1,3-dichloropropylene	<1000	1000
trichlorofluoromethane	<1000	1000	1,1,2-trichloroethane	<1000	1000
1,1-dichloroethylene	<1000	1000	2-chloroethylvinyl ether	<1000	1000
1,1-dichloroethane	<1000	1000	bromoform	<1000	1000
1,2-dichloroethylene	<1000	1000	tetrachloroethylene	<1000	1000
chloroform	28000	1000	1,1,2,2-tetrachloroethane	<1000	1000
1,2-dichloroethane	<1000	1000	toluene	<1000	1000
1,1,1-trichloroethane	<1000	1000	chlorobenzene	43000	1000
carbon tetrachloride	<1000	1000	ethylbenzene	<1000	1000

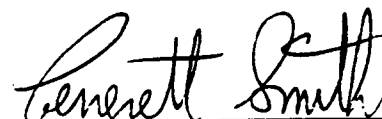
NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<6000	6000	vinyl acetate	<2000	2000
acetone	<2000	2000	4-methyl-2-pentanone	<2000	2000
carbon disulfide	<1000	1000	2-hexanone	<2000	2000
1,1,2-trichloro-			styrene	<1000	1000
1,2,2-trifluoroethane	<1000	1000	xylenes	<1000	1000
2-butanone	<2000	2000			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

(K/J/C 904020.00)

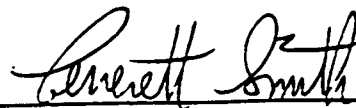
Source:	D.A.C.
Lab. No.:	910889
Sample I.D.:	Dup. 2-K1
Matrix:	Water
Depth:	--
Date Collected:	02/01/91
Time Collected:	1145
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-22/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.9	±0.1
Conductivity @ 25 °C	umhos/cm	2600	2
Total Dissolved Solids(180 °C)	mg/L	2000	2
Total Hardness(CaCO3)	mg/L	1300	1
Calcium(Ca)(1)	mg/L	360	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	90	0.1
Sodium(Na)(1)	mg/L	140	0.5
Potassium(K)(1)	mg/L	12	0.5
T. Alkalinity(CaCO3)	mg/L	580	2
Bicarbonate Alk.(HCO3)	mg/L	710	1
Chloride(Cl)	mg/L	700	0.5
Sulfate(SO4)	mg/L	130	0.6
Nitrate Nitrogen(N)	mg/L	2.1	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

Quality Control Page
(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910889
Sample I.D.:	Dup. 2-K1
Matrix:	Water
Depth:	---
Date Collected:	02/01/91
Time Collected:	1145
Collected by:	K/J/C
Date Extracted:	---
Date Analyzed:	02/08/91
Analytical Method:	---

Analysis	Units	Replicate	Analytical Results	Det. Lim.
Sulfate(SO4)	mg/L	128	138	Spike Recovery 127% 0.6

Comments: Results reported in milligrams per liter (mg/L).

Analyst R. Sheidgant

Manager 

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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910806
Sample I.D.: Field Blank
Matrix: Water
Depth: --
Date Collected: 01/31/91
Time Collected: 1030
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager

Genereeth Smith

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Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

(K/J/C 904020.00)

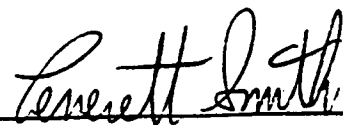
Source:	D.A.C.
Lab. No.:	910806
Sample I.D.:	Field Blank
Matrix:	Water
Depth:	--
Date Collected:	01/31/91
Time Collected:	1030
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-27/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	5.5	±0.1
Conductivity @ 25 °C	umhos/cm	28	2
Total Dissolved			2
Solids(180 °C)	mg/L	7	1
Total Hardness(CaCO3)	mg/L	<1	0.1
Calcium(Ca)(1)	mg/L	<0.1	0.1
Iron(Fe)(1)	mg/L	<0.1	0.1
Magnesium(Mg)(1)	mg/L	<0.1	0.5
Sodium(Na)(1)	mg/L	<0.5	0.5
Potassium(K)(1)	mg/L	<0.5	2
T. Alkalinity(CaCO3)	mg/L	<2	1
Bicarbonate Alk.(HCO3)	mg/L	<1	0.5
Chloride(Cl)	mg/L	<0.5	0.6
Sulfate(SO4)	mg/L	<0.6	0.02
Nitrate Nitrogen(N)	mg/L	0.18	

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910806
Sample I.D.:	Field Blank
Matrix:	Water
Depth:	--
Date Collected:	01/31/91
Time Collected:	1030
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/27/91
Analytical Method:	--

Analysis	Units	Replicate	Analytical Results	Det. Lim.
Chloride(Cl)	mg/L	<0.5	<0.5	Spike Recovery 110% 0.5
Sulfate(SO4)	mg/L	<0.6	<0.6	Spike Recovery 95% 0.6

Comments: Results reported in milligrams per liter (mg/L).

Analyst R. Sheidgant

Manager 

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Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910887
Sample I.D.: Field Blank
Matrix: Water
Depth: ---
Date Collected: 02/01/91
Time Collected: 0930
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylenes	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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Received	02/05/91
Reported	02/27/91

(K/J/C 904020.00)

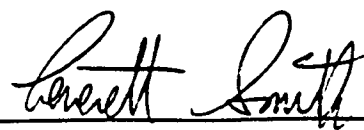
Source:	D.A.C.
Lab. No.:	910887
Sample I.D.:	Field Blank
Matrix:	Water
Depth:	--
Date Collected:	02/01/91
Time Collected:	0930
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-27/91
Analytical Method:	--

Analysis	Units	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.0	±0.1
Conductivity @ 25 °C	umhos/cm	11	2
Total Dissolved			
Solids(180 °C)	mg/L	<2	2
Total Hardness(CaCO3)	mg/L	<1	1
Calcium(Ca)(1)	mg/L	0.11	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	<0.1	0.1
Sodium(Na)(1)	mg/L	<0.5	0.5
Potassium(K)(1)	mg/L	<0.5	0.5
T. Alkalinity(CaCO3)	mg/L	<2	2
Bicarbonate Alk.(HCO3)	mg/L	<1	1
Chloride(Cl)	mg/L	<0.5	0.5
Sulfate(SO4)	mg/L	<0.6	0.6
Nitrate Nitrogen(N)	mg/L	0.12	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910808
Sample I.D.: MW-11 SPK
Matrix: Water
Depth: ---
Date Collected: 01/31/91
Time Collected: 1110
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<250	250	bromodichloromethane	<125	125
bromomethane	<250	250	1,2-dichloropropane	<125	125
vinyl chloride	<250	250	trans-1,3-dichloropropylene	<125	125
chloroethane	<250	250	trichloroethylene	<125	125
methylene chloride	<125	125	benzene	<125	125
acrolein	<750	750	dibromochloromethane	<125	125
acrylonitrile	<250	250	cis-1,3-dichloropropylene	<125	125
trichlorofluoromethane	<125	125	1,1,2-trichloroethane	<125	125
1,1-dichloroethylene	<125	125	2-chloroethylvinyl ether	<125	125
1,1-dichloroethane	<125	125	bromoform	<125	125
1,2-dichloroethylene	<125	125	tetrachloroethylene	330	125
chloroform	1200	125	1,1,2,2-tetrachloroethane	<125	125
1,2-dichloroethane	<125	125	toluene	<125	125
1,1,1-trichloroethane	<125	125	chlorobenzene	5300	125
carbon tetrachloride	<125	125	ethylbenzene	<125	125

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<750	750	vinyl acetate	<250	250
acetone	<250	250	4-methyl-2-pentanone	<250	250
carbon disulfide	<125	125	2-hexanone	<250	250
1,1,2-trichloro-			styrene	<125	125
1,2,2-trifluoroethane	<125	125	xylene	<125	125
2-butanone	<250	250			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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Irvine, CA 92714

Received 02/01/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910763
Sample I.D.: Travel Blank
Matrix: Water
Depth: —
Date Collected: 01/29/91
Time Collected: —
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylenes	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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San Francisco, CA 94107
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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/03/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910812
Sample I.D.: Travel Blank
Matrix: Water
Depth: —
Date Collected: 01/29/91
Time Collected: —
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager

Conerett Smith

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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/05/91
Reported 02/21/91

(K/J/C 904020.00)

Source: D.A.C.
Lab. No.: 910893
Sample I.D.: Travel Blank
Matrix: Water
Depth: ---
Date Collected: 01/29/91
Time Collected: ---
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylenes	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received --
Reported 02/21/91
Quality Control Page
(K/J/C 904020.00)

Source: ---
Lab. No.: Method Blank
Sample I.D.: Reagent Water
Matrix: Water
Depth: ---
Date Collected: ---
Time Collected: ---
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/12/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received —
Reported 02/21/91
Quality Control Page
(K/J/C 904020.00)

Source: —
Lab. No.: Method Blank
Sample I.D.: Reagent Water
Matrix: Water
Depth: —
Date Collected: —
Time Collected: —
Collected by: K/J/C
Date Extracted: —
Date Analyzed: 02/13/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager

Robert Smith

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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received --
Reported 02/21/91
Quality Control Page
(K/J/C 904020.00)

Source: --
Lab. No.: Method Blank
Sample I.D.: Reagent Water
Matrix: Water
Depth: --
Date Collected: --
Time Collected: --
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/14/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylene	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received ---
Reported 02/21/91
Quality Control Page
(K/J/C 904020.00)

Source: ---
Lab. No.: Method Blank
Sample I.D.: Methanol Solvent Used For Sample Prep.
Matrix: Aqueous
Depth: ---
Date Collected: ---
Time Collected: ---
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/15/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<500	500	bromodichloromethane	<250	250
bromomethane	<500	500	1,2-dichloropropane	<250	250
vinyl chloride	<500	500	trans-1,3-dichloropropylene	<250	250
chloroethane	<500	500	trichloroethylene	<250	250
methylene chloride	<250	250	benzene	<250	250
acrolein	<1500	1500	dibromochloromethane	<250	250
acrylonitrile	<500	500	cis-1,3-dichloropropylene	<250	250
trichlorofluoromethane	<250	250	1,1,2-trichloroethane	<250	250
1,1-dichloroethylene	<250	250	2-chloroethylvinyl ether	<250	250
1,1-dichloroethane	<250	250	bromoform	<250	250
1,2-dichloroethylene	<250	250	tetrachloroethylene	<250	250
chloroform	<250	250	1,1,2,2-tetrachloroethane	<250	250
1,2-dichloroethane	<250	250	toluene	<250	250
1,1,1-trichloroethane	<250	250	chlorobenzene	<250	250
carbon tetrachloride	<250	250	ethylbenzene	<250	250

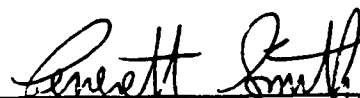
NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<1500	1500	vinyl acetate	<500	500
acetone	<500	500	4-methyl-2-pentanone	<500	500
carbon disulfide	<250	250	2-hexanone	<500	500
1,1,2-trichloro-			styrene	<250	250
1,2,2-trifluoroethane	<250	250	xylene	<250	250
2-butanone	<500	500			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received --
Reported 02/21/91
Quality Control Page
(K/J/C 904020.00)

Source: --
Lab. No.: Method Blank
Sample I.D.: Reagent Water
Matrix: Water
Depth: --
Date Collected: --
Time Collected: --
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/15/91
EPA Analytical Method: 8240

PRIORITY POLLUTANT COMPOUNDS

Volatiles	ug/L(ppb)	Det.Lim.	Volatiles	ug/L(ppb)	Det.Lim.
chloromethane	<10	10	bromodichloromethane	<5	5
bromomethane	<10	10	1,2-dichloropropane	<5	5
vinyl chloride	<10	10	trans-1,3-dichloropropylene	<5	5
chloroethane	<10	10	trichloroethylene	<5	5
methylene chloride	<5	5	benzene	<5	5
acrolein	<30	30	dibromochloromethane	<5	5
acrylonitrile	<10	10	cis-1,3-dichloropropylene	<5	5
trichlorofluoromethane	<5	5	1,1,2-trichloroethane	<5	5
1,1-dichloroethylene	<5	5	2-chloroethylvinyl ether	<5	5
1,1-dichloroethane	<5	5	bromoform	<5	5
1,2-dichloroethylene	<5	5	tetrachloroethylene	<5	5
chloroform	<5	5	1,1,2,2-tetrachloroethane	<5	5
1,2-dichloroethane	<5	5	toluene	<5	5
1,1,1-trichloroethane	<5	5	chlorobenzene	<5	5
carbon tetrachloride	<5	5	ethylbenzene	<5	5

NON-PRIORITY POLLUTANT COMPOUNDS

acetonitrile	<30	30	vinyl acetate	<10	10
acetone	<10	10	4-methyl-2-pentanone	<10	10
carbon disulfide	<5	5	2-hexanone	<10	10
1,1,2-trichloro-			styrene	<5	5
1,2,2-trifluoroethane	<5	5	xylenes	<5	5
2-butanone	<10	10			

Comments: Results reported in micrograms per liter.

Analyst Darrell Cain, Bill Svoboda

Manager



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San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 303 Second Street, Tenth Floor North
San Francisco, CA 94107

Received	--
Reported	02/27/91

Quality Control Page
(K/J/C 904020.00)

Source: --
Lab. No.: Method Blank
Sample I.D.: Reagent Water
Matrix: Water
Depth: --
Date Collected: --
Time Collected: --
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/21/91
EPA Analytical Method: 8010

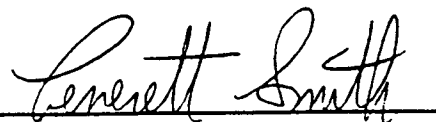
Analysis	Units	Analytical Results	Det. Lim.
chloromethane	ug/L	<0.5	0.5
bromomethane	ug/L	<0.5	0.5
vinyl chloride	ug/L	<0.5	0.5
chloroethane	ug/L	<0.5	0.5
methylene chloride	ug/L	<0.5	0.5
trichlorofluoromethane	ug/L	<0.5	0.5
1,1-dichloroethylene	ug/L	<0.5	0.5
1,1-dichloroethane	ug/L	<0.5	0.5
1,2-dichloroethylene	ug/L	<0.5	0.5
chloroform	ug/L	<0.5	0.5
1,1,2-trichloro-			
1,2,2-trifluoroethane	ug/L	<0.5	0.5
1,2-dichloroethane	ug/L	<0.5	0.5
1,1,1-trichloroethane	ug/L	<0.5	0.5
carbon tetrachloride	ug/L	<0.5	0.5
bromodichloromethane	ug/L	<0.5	0.5
1,2-dichloropropane	ug/L	<0.5	0.5
cis-1,3-dichloropropylene	ug/L	<0.5	0.5
trichloroethylene	ug/L	<0.5	0.5
1,1,2-trichloroethane	ug/L	<0.5	0.5
chlorodibromomethane	ug/L	<0.5	0.5
trans-1,3-dichloropropylene	ug/L	<0.5	0.5
2-chloroethylvinyl ether **	ug/L	<0.5	0.5
bromoform	ug/L	<0.5	0.5
tetrachloroethylene	ug/L	<0.5	0.5
1,1,2,2-tetrachloroethane	ug/L	<0.5	0.5
chlorobenzene	ug/L	<0.5	0.5

Comments: Results reported in micrograms per liter. ** Unstable compound.

* Non-aqueous fraction of the sample.

Analyst Kevin Draper, Tina Mah

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	—
Reported	02/21/91

Quality Control Page

Sample Identification		Percent Recoveries of Surrogate Standards		
Lab. No.	Type	1,2-dichloroethane-d4	toluene-d8	4-bromofluorobenzene
Method Blk.	Water	107	109	103
910757	Water	114	110	106
910758	Water	109	107	102
910759	Water	114	108	110
910760	Water	112	110	102
Method Blk.	Water	89	94	109
910761	Water	90	98	109
910762	Water	80	92	115
910763	Water	90	93	114
910806	Water	90	93	109
910805	Water	90	90	108
910807	Water	94	97	114
910808	Water	98	94	114
910809	Water	96	97	111

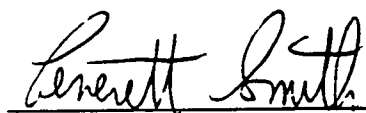
Acceptable Recoveries

	Water	Soil
1,2-dichloroethane-d4	76-114	70-121
toluene-d8	88-110	81-117
4-bromofluorobenzene	86-115	74-121

Comments: Analysis by U.S. EPA Method 8240.

Analyst Darrell Cain, Bill Svoboda

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division

303 Second Street, Tenth Floor North

San Francisco, CA 94107

415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received 02/28/90

Reported 02/28/90

Quality Control Page

<u>Sample Identification</u>		<u>Percent Recoveries of Surrogate Standards</u>		
<u>Lab. No.</u>	<u>Type</u>	<u>1,2-dichloroethane-d4</u>	<u>toluene-d8</u>	<u>4-bromofluorobenzene</u>
Method Blk.	Water	95	91	103
910811	Water	110	105	115
910810	Water	109	88	110
910812	Water	95	99	109
910887	Water	100	96	108
910890	Water	103	102	114
910886	Water	107	91	96
910888	Water	114	93	104
910889	Water	111	99	108
910892	Water	112	98	105
Method Blk.	Water	106	92	100
910893	Water	111	93	100
Method Blk.	Water	98	94	105
910891	Water	84	88	101
910891	Methanol Extract	96	88	112
Method Blk.	MeOH	104	93	114

Acceptable Recoveries

Water

Soil

1,2-dichloroethane-d4
toluene-d8
4-bromofluorobenzene

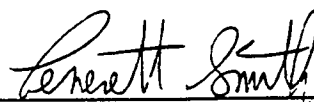
76-114
88-110
86-115

70-121
81-117
74-121

Comments: Analysis by U.S. EPA Method 8240.

Analyst Darrell Cain, Bill Svoboda

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91

Quality Control Page
(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910811
Sample I.D.:	MW-03-K1
Matrix:	Water
Depth:	--
Date Collected:	01/31/91
Time Collected:	1710
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07-11/91
Analytical Method:	--

Analysis	Units	Replicate	Analytical Results	Det. Lim.
Total Dissolved				
Solids(180 °C)	mg/L	711	707	Spike Recovery 102% 2
Chloride(Cl)	mg/L	175	175	Spike Recovery 100% 0.5

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst R. Sheidgant

Manager 

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LABORATORY REPORT

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303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/03/91
Reported	02/27/91
Quality Control Page (K/J/C 904020.00)	

Source: D.A.C.
Lab. No.: 910810
Sample I.D.: MW-07-K1
Matrix: Water
Depth: ---
Date Collected: 01/31/91
Time Collected: 1520
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/07-22/91
Analytical Method: ---

Analysis	Units	Replicate	Analytical Results		Det. Lim.
pH (Laboratory)	Unit	6.8	6.8		±0.1
Conductivity @ 25 °C	umhos/cm	2845	2727	Spike Recovery 89%	2
Total Hardness(CaCO3)	mg/L	1700	1700	Spike Recovery 105%	1
Calcium(Ca)(1)	mg/L	447	452	Spike Recovery 103%	0.1
Iron(Fe)(1)	mg/L	0.0696	0.0709	Spike Recovery 83%	0.01
Magnesium(Mg)(1)	mg/L	146	147	Spike Recovery 106%	0.1
Sodium(Na)(1)	mg/L	184	188	Spike Recovery 96%	0.5
Potassium(K)(1)	mg/L	6.44	6.39	Spike Recovery 83%	0.5
T. Alkalinity(CaCO3)	mg/L	440	420		2
Bicarbonate Alk.(HCO3)	mg/L	537	512		1

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, T. Kirkpatrick, T. DeLeon

Manager



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303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

Quality Control Page
(K/J/C 904020.00)

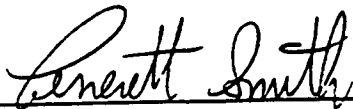
Source:	D.A.C.
Lab. No.:	910892
Sample I.D.:	MW-09-K1
Matrix:	Water
Depth:	--
Date Collected:	02/01/91
Time Collected:	1600
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07/91
Analytical Method:	--

Analysis	Units	Replicate	Analytical Results	Det. Lim.
Nitrate Nitrogen(N)	mg/L	0.51	0.57	Spike Recovery 90% 0.02

Comments: Results reported in milligrams per liter (mg/L).

Analyst P. Cheung

Manager



This report applies only to the sample investigated and is not necessarily indicative of the quality of apparently identical or similar samples. The liability of the laboratory is limited to the amount paid for the report by the issuee. The issuee assumes all liability for the further distribution of this report or its contents and by making such distribution agrees to hold the laboratory harmless against all claims of persons so informed of the contents hereof.

LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
San Francisco, CA 94107
415-362-6065

For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	--
Reported	02/27/91

Quality Control Page
(K/J/C 904020.00)

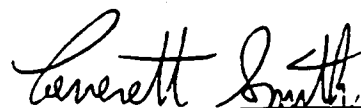
Source: ---
Lab. No.: Method Blank
Sample I.D.: Reagent Water
Matrix: Water
Depth: ---
Date Collected: ---
Time Collected: ---
Collected by: K/J/C
Date Extracted: ---
Date Analyzed: 02/07-22/91
Analytical Method: ---

Analysis	Units	Analytical Results	Det. Lim.
Conductivity @ 25 °C	umhos/cm	<2	2
Total Dissolved Solids(180 °C)	mg/L	<2	2
Total Hardness(CaCO3)	mg/L	<1	1
Calcium(Ca)(1)	mg/L	<0.1	0.1
Iron(Fe)(1)	mg/L	<0.01	0.01
Magnesium(Mg)(1)	mg/L	<0.1	0.1
Sodium(Na)(1)	mg/L	<0.5	0.5
Potassium(K)(1)	mg/L	<0.5	0.5
T. Alkalinity(CaCO3)	mg/L	<2	2
Bicarbonate Alk.(HCO3)	mg/L	<1	1
Chloride(Cl)	mg/L	<0.5	0.5
Sulfate(SO4)	mg/L	<0.6	0.6
Nitrate Nitrogen(N)	mg/L	<0.02	0.02

Comments: (1) Analysis by inductively coupled argon plasma emission spectroscopy; lab filtered on 02/06/91.
Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung
T. Kirkpatrick, T. DeLeon

Manager



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Received 02/01/91
Reported 02/27/91
Quality Control Page
(K/J/C 904020.00)

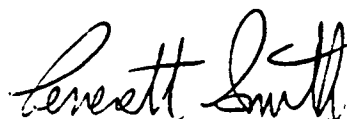
Source: D.A.C.
Lab. No.: 910757
Sample I.D.: MW-18-K1
Matrix: Water
Depth: --
Date Collected: 01/30/91
Time Collected: 1000
Collected by: K/J/C
Date Extracted: --
Date Analyzed: 02/07-11/91
Analytical Method: --

Analysis	Units	Replicate	Analytical Results	Det. Lim.
pH (Laboratory)	Unit	6.6	6.7	±0.1
Conductivity @ 25 °C	umhos/cm	640	640	2
Total Dissolved Solids(180 °C)	mg/L	402	394	2
T. Alkalinity(CaCO3)	mg/L	201	205	2
Bicarbonate Alk.(HCO3)	mg/L	245	250	1
Chloride(Cl)	mg/L	66	66	0.5
Sulfate(SO4)	mg/L	37.5	35.5	0.6

Comments: Results reported in milligrams per liter (mg/L), except as indicated.
"umhos/cm" means "micromhos per centimeter"

Analyst K. Draper, R. Sheidgant, P. Cheung

Manager



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LABORATORY REPORT

Kennedy/Jenks/Chilton, Laboratory Division
303 Second Street, Tenth Floor North
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For: Kennedy/Jenks/Chilton
Attention: Jim Lenoci
Address: 17310 Red Hill Avenue, Suite 220
Irvine, CA 92714

Received	02/05/91
Reported	02/27/91

Quality Control Page
(K/J/C 904020.00)

Source:	D.A.C.
Lab. No.:	910887
Sample I.D.:	MW-18-K1
Matrix:	Water
Depth:	--
Date Collected:	02/01/91
Time Collected:	0930
Collected by:	K/J/C
Date Extracted:	--
Date Analyzed:	02/07/91
Analytical Method:	--

Analysis	Units	Replicate	Analytical Results	Det. Lim.
Nitrate Nitrogen(N)	mg/L	0.12	0.11	Spike Recovery 100% 0.02

Comments: Results reported in milligrams per liter (mg/L).

Analyst P. Cheung

Manager 

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